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NOTE

This fourth volume (1929-31) of *Mineralogical Abstracts* contains 1,553 abstracts. They are roughly grouped under the following headings:

Artificial Minerals (pp. 169, 304, 385).
Bibliographies (pp. 49, 485).
Chemical Constitution of Silicates (pp. 196, 354).
Chemical Crystallography (pp. 162, 300).
Colour of Minerals (p. 251).
Crystal-optics (pp. 55, 206, 442).
Economic Minerals and Ore-deposits (pp. 73, 227, 408).
Growth and Corrosion of Crystals (pp. 171, 349).
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Instruments and Apparatus (p. 503).
Mathematical Crystallography (pp. 52, 152, 297, 439).
Meteorites (p. 416).
Meteorites and Tektites (pp. 117, 257).
Miscellaneous (pp. 81, 135, 185, 234, 325, 377, 429, 478, 515).
New Minerals (pp. 8, 147, 244, 341, 496).
Notices of Books (pp. 1, 145, 193, 241, 337, 443, 481).
Physical Properties (pp. 59, 212, 450).
Precious Stones (pp. 67, 289).
Pseudomorphs (p. 505).
Radioactivity (p. 112).
Rock-forming Minerals and Petrology (pp. 37, 123, 216, 282, 388, 507).
Topographical Mineralogy (pp. 178, 309, 468).
X-rays and Crystal-structure (pp. 16, 97, 156, 264, 358, 458).
Zeolites (pp. 316, 371).

In the preparation of the abstracts the indexing has been kept constantly in view. Many points receive a bare mention in the abstracts to ensure their inclusion in the index. It is hoped that by this means the searcher will be put in touch with the original literature. The Alphabetical Index (pp. 545-621) of Authors, Subjects, and *Localities* is preceded by a Topographical Index (pp. 529-544).

ERRATA.

Mineralogical Abstracts, vol. 3.

Page.	Line.	
66	8*	*For* E. S. Federov *read* E. S. Fedorov
112	5*	*For* $PbSe.Cu_2S.(Ni,Co)Se_3$ *read* $PbSe.Cu_2Se.3(Ni,Co)Se$
239	12*	*For* a 1·577 *read* a 1·557
364	8	For *cm* read *xm*
370	13	*For* $2Al_2O_3.6H_2O.5H_2O$ *read* $2Al_2O_3.6SiO_2.5H_2O$
388	20	*For* pp. 117–12 *read* pp. 117–125
399	19	*For* 0·0000074 *read* 0·000074
—	20	*For* 0·000006 *read* 0·00006
505	1	For *Borostyánskői* read *Borostyánkői*
550	4	*For* pp. 128–153 *read* pp. 129–153
617	col. 1	For *Idria* = *Irija* read *Idria* = *Idrija*
620	col. 1	For *Kałusz, Poland* 558, 21–479 *read* ... 21–476
632	col. 1	*For* Melnikovite *read* Melnikovite
664	col. 2, line 3	*For* — *v.* Kôzu (S.) *read* Suzuki (M.) *v.* Kôzu (S.)
671	col. 2	*For* Uranophane, *Katanga*, 485 *read* ... 484

Mineralogical Abstracts, vol. 4.

13	5	For $a:b:c = 0·6730:1:1868$ *read* ... $0·6730:1:1·1868$
—	6	For $a:b:c = 0·6877:1:1·932$ *read* ... $0·6877:1:1·1932$
—	7	For *Krista'lographic* read *Kristallographie*
15	13	For *juliéniete* read *juliénite*
31	12*	*For* (Albite β) 115° 29′ *read* 116° 29′
32	11*	*For* pp. 306–606 *read* pp. 603–606
39	7	*For* W. Wah *read* W. Wahl
43	2*	*For* olivine, together with optical data). *read* olivine) together with optical data.
51	21	*For* Warszaw *read* Warszawa
71	19*	*For* α-Al_2O_3 *read* γ-Al_2O_3
109	15	*For* $Si_2O_5Be.SiO_5NaH$ *read* $Si_2O_5Be.SiO_3NaH$
117	15*	*For* pp. 1–15 *read* pp. 332–346
121	7*	*For* pp. 477–513 *read* pp. 477–514
136	13*	For *arsenopisite* read *arsenopirite*
—	10*	*For* tale-schist *read* talc-schist
174	14	*For* influence *read* influences
175	19*	*For* principle *read* principal
206	3	*For* M.A. 3–3 *read* M.A. 3–374
248	8	*Add* SiO_2 2·67
336	12*	*For* molybdic acid *read* phosphoric acid
346	20	For *Mmbesy* read *Mmbrsy* and (230)?
351	12	*For* is *read* are
453	1*	*For* 4–254 *read* 4–294
464	3*	*For* Bedford Ontario *read* Bedford, Ontario
511	8*	*For* n , ser. *read* n. ser.,

* From bottom of page.

MINERALOGICAL ABSTRACTS

(Vol. 4, No. 1, March, 1929.)

Notices of Books.

Ott (H.). *Strukturbestimmung mit Röntgeninterferenzen.* Pp. 1–322, 7 pls., 187 text-figs., index pp. 423–429.

Herzfeld (K. F.). *Gittertheorie der festen Körper.* Pp. 323–422, 9 figs., index pp. 430–433. Handbuch der Experimentalphysik, herausg. v. W. Wien u. F. Harms, vol. 7, pt. 2, Leipzig (Akademische Verlagsgesellschaft), 1928, xii + 433 pp. Price 37 Mk., bound 39 Mk.

This volume contains two monographs, the first being in natural sequence to the preceding volume on structure theory [M.A. **3**–509], and the second being a theoretical study of some problems in the physics of the solid state. The author can refer his readers to handbooks already published on the purely theoretical and technical sides and devotes over 300 pages to an account of the fascinating results achieved by the X-ray study of crystals. His work has the advantage, therefore, of covering the field more thoroughly than those popular accounts which must of necessity include chapters on crystallography and X-ray physics. The volume also compares favourably with more advanced treatises in that the work of any one school is not given undue prominence. Considerable space, for instance, is devoted to the intensity measurements of the Bragg-Darwin school and the description of recent work is much more than a résumé of papers in the German journals of recent date. The chapters dealing with the determination of the space-group and atomic parameters suffer, however, from Weissenburg's geometrical influence, and it is surprising that Niggli's topological methods, described at such length in the preceding volume, find no practical application here. The numerous reproductions of rotation, oscillation, and powder photographs are excellent examples of the high standard of technique that has been reached. The author does not commit himself to the view that the X-ray method has attained its limits; undoubtedly accurate intensity measurements can still do more. He voices the general plea, however, for deliverance from the laborious routine of space-group and parameter determination, for some simple discovery, some magnum opus, as far-reaching

as Bohr's conceptions have been for spectroscopy. It is inevitable that the second monograph should have been crowded into comparatively few pages. There are signs, however, that the day is not far distant when this monograph will attain the dignity of a separate volume. The student will find here a useful summary of theoretical work that has been carried out on physical properties of crystals. It is now becoming of urgent necessity to determine such physical properties that will give independent evidence as to the positions of atoms and electrons in a lattice, evidence that is at present derived from X-ray intensity measurements. F. A. B.

Kohlrausch (K. W. F.). *Radioaktivität.* Handbuch der Experimentalphysik, herausg. v. W. Wien u. F. Harms, vol. 15, Leipzig (Akademische Verlagsgesellschaft), 1928, xiii + 885 pp., 285 figs. Price 79 Mk., bound 81 Mk.

This exhaustive treatise on radioactivity includes long chapters on α-, β-, and γ-radiations, with numerous references to the literature (English as well as German). Being written from a physical point of view, there are only occasional references to minerals. Uraninite or pitchblende, the principal source of all radioactive substances, is not listed in the index. Pleochroic haloes, age of uranium minerals, luminescent effects and change in colour produced by the radiations are only briefly mentioned, although these aspects of the subject now have quite an extensive literature, but in journals other than physical. L. J. S.

Lenard (P.), Schmidt (Ferd.), & Tomaschek (R.). *Phosphoreszenz und Fluoreszenz.* xxiii + viii + 1038 pp., 214 figs., index pp. 1515–32.
—— & Becker (A.). *Lichtelektrische Wirkung.* pp. ix–xi, 1039–1514, 200 figs., index pp. 1533–1544. Handbuch der Experimentalphysik, herausg. v. W. Wien u. F. Harms, vol. 23, Leipzig (Akademische Verlagsgesellschaft), 1928; 1. Teil, xxiii + 741 pp., price 69 Mk. (bound 71 Mk.); 2. Teil, xi + 745–1544 pp., price 70 Mk., bound 72 Mk.

These two thick handsomely bound volumes, well printed on good paper, would surely convey the impression that nothing more is to be known about phosphorescence and fluorescence. As a matter of fact they appear to throw very little light on this obscure subject. The verbosity and arrangement of the matter are bewildering, and the four indexes at the end of the second volume only add to the confusion. The fifteen chapters of the first treatise run on with the same pagina-

tion into the second volume (Teil 2). This is followed by nine chapters on light-electrical effects, forming a second treatise in the latter part of the same volume. The matter is very largely a reiteration of the numerous physical papers by P. Lenard and his co-workers at Heidelberg. It is strange to find no mention of the pioneer work of Sir David Brewster on fluorescence. (Against his name in the index there are but two references—one to a wrong page and the other to a footnote.) The names of Sir John Herschel and J. H. Gladstone do not appear. Minerals receive some mention, but the many interesting observations recorded in mineralogical literature are entirely overlooked. The price (£7) of these volumes is colossal. The policy of issuing scientific books and periodicals at such prices is surely suicidal, but it will no doubt act automatically as a useful check on the voluminosity of German scientific literature. L. J. S.

Danckwortt (P. W.). *Lumineszenz-Analyse im filtrierten ultravioletten Licht. Ein Hilfsbuch beim Arbeiten mit der Analysen-Lampe.* Leipzig (Akademische Verlagsgesellschaft), 1928, vii + 106 pp., 16 pls., 26 text-figs. Price 6·50 Mk., bound 7·80 Mk.

This thin volume is for the most part a compilation from current German technical and abstract journals (mostly since 1926), and it gives a very good idea of the vast amount of work that is now being done on the testing of materials of all kinds by means of the luminescent (fluorescent and phosphorescent) effects excited in them when exposed to ultra-violet rays. Various forms of apparatus are mentioned, but preference is given to the 'Hanovia analytic lamp', which consists of a silica-glass mercury-vapour lamp provided with a dark 'uviol' glass filter. Samples to be tested are simply placed in the dark chamber of the apparatus, when similarities or differences are at once apparent, whereas by ordinary analytic methods long and tedious processes would be involved. A brief account is given of the effects shown by certain minerals and precious stones. L. J. S.

Kraus (Edward Henry) & Hunt (Walter Fred.). *Mineralogy, an introduction to the study of minerals and crystals.* Second edition, New York & London (McGraw-Hill), 1928, ix + 604 pp., 766 figs. Price 25*s*.

The first edition of this useful and well-illustrated elementary textbook appeared in 1920 [M.A. **1**–116], and since then there have been four impressions. The new edition shows an increase of forty pages and seventy figures. A new chapter has been added on crystal-

structure and X-ray analysis. In the economic section several new illustrations are given of mine workings. Portraits (now 22) of mineralogists include the only published picture of W. H. Miller.

L. J. S.

Winchell (Alexander N.). *Elements of optical mineralogy: an introduction to microscopic petrography. Part I. Principles and methods.* 3rd edition, New York (J. Wiley & Sons) and London (Chapman & Hall), 1928, viii + 238 pp., 261 figs. Price 17*s.* 6*d.*

Except for a few minor alterations and a new figure (fig. 84 *a*) this edition is a reprint of the second edition of 1922 [M.A. **2**–2] with the addition of a new chapter on special methods. This chapter (Chap. XX, pp. 209–230) gives an outline of the universal-stage method of Fedorov (misspelt Federoff) for the determination of the optical orientation and the optic axial angle, and of the dispersion method for determining the refractive indices of grains when immersed in various liquids. The 'single dispersion method' depends on variations in the refractive index of the liquid with either the wave-length or the temperature; and the 'double dispersion method' makes use of both these variations [M.A. **3**–323].

L. J. S.

Fairbanks (Ernest E.) [& others]. *The laboratory investigation of ores. A symposium.* New York & London (McGraw-Hill), 1928, ix + 262 pp., 110 figs. Price 17*s.* 6*d.*

This book, edited by E. E. Fairbanks, is a collection of important and readable articles dealing with various branches of the new methods in which the microscope is applied to the study of ore-minerals. Being by different authors, conflicting views are in some cases expressed, but this will surely stimulate discussion and research. The following list of the thirteen chapters will give some idea of the scope of the volume:

Lindgren (W.). Historical review of the study of polished sections of opaque minerals.
Fairbanks (E. E.). Microscopes, their construction and use.
Davey (W. P.). Crystal analysis by means of X-rays.
Loveland (R. P.) and Trivelli (A. P. H.). Practical photomicrography.
Fairbanks (E. E.). Dielectric methods.
Lane (A. C.). Genetic significance of grain.
Colony (R. J.). Ore-mineral sequence.
Newhouse (W. H.). The microscopic criteria of replacement in the opaque ore minerals.
Thiel (G. A.). The textural relationships of the opaque manganese minerals.

Bowen (N. L.). Geologic thermometry.
Guild (F. N.). The enrichment of silver ores.
Fairbanks (E. E.). Zonal distribution.
Schwartz (G. M.). Ore-dressing microscopy.

L. J. S.

Rinne (Friedrich). *Gesteinskunde für Studierende der Naturwissenschaft, Forstkunde und Landwirtschaft, Bergingenieure, Architekten und Bauingenieure.* 10th and 11th edit., Leipzig (Max Jänecke), 1928, viii + 428 pp., 1 pl., 589 text-figs. Price 18 Mk., bound 19·50 Mk.

The title of this book indicates the wide circle of readers to which it will appeal. The author has given an excellent account of the subject of petrology, dealing with all rocks, including salt-deposits, coal, oil, ice, ore-deposits, and meteorites. In bringing the book up-to-date many new subjects have been introduced, and the present edition contains more than twice as many pages as the first edition which appeared in 1901. There are chapters dealing with the general modes of occurrence of rocks, the disturbances they have suffered, structure and texture, methods of examination, rock-forming minerals, &c. In Chapter VIII there is a most useful summary of much scattered information on those properties of rocks of particular technical importance, such as crushing-loads, resistance to weathering, porosity, and the like. In this chapter one finds some account of the state of strain in rocks investigated by experiments on bent glass-plates, gelatine-strips, and salt-crystals, a subject to which the author himself has made several recent contributions. Another interesting subject introduced in this chapter is the study of the orientation of the grains in quartzite in relation to the tectonic forces to which the rocks have been subjected (Gefügeregelung). While the main interest of the book lies on the geological and technical side of petrology, mineralogists also will find it full of useful information. It is admirably illustrated, and is provided with a good index.

W. C. S.

Jakob (J.). *Anleitung zur chemischen Gesteinsanalyse.* Sammlung naturwissenschaftlicher Praktika, vol. 15, Berlin (Borntraeger), 1928, vii + 81 pp., 3 figs. Price bound 7 Mk.

A compact laboratory manual of rock analysis, intended primarily for students, giving fully detailed instructions for each process (at the cost of some repetition), and avoiding the description of numerous alternative methods. The author draws a sharp distinction between rock analysis and mineral analysis, the latter aiming at the highest

order of accuracy and time being immaterial, while the former does not attempt such a high degree of accuracy since the rock will probably vary very appreciably in composition from part to part, but speed is desirable. The methods described are in the main those usually employed and described in the classical manuals of Washington and Hillebrand; but the author's preference for a borax-soda fusion for the solution of titanium dioxide, and the large proportion of soda used in soda-fusions may be noted. Only the soda-fusion method of attack is described, and manganese is determined colorimetrically or gravimetrically according as it is present to a less or greater extent than 1·0 %; for its separation only the basic acetate method is described. Titanium is estimated colorimetrically, and if present to a greater extent than 2·5 %, the separation of alumina from iron and titanium by caustic alkali is employed. Although the book is primarily intended for students, the estimation of the less common rock constituents is described in some detail. M. H. H.

Löwe (Fritz). *Atlas der letzen Linien der wichtigsten Elemente.* Dresden & Leipzig (Theodor Steinkoff), 1928, 44 pp., 16 pls., 2 text-figs. Price bound 12 Mk.

An atlas and tables for spectrum analysis. The atlas shows portions of the spectra of 44 elements, each in four small concentrations in a carbon spark under accurately specified conditions, the portions being chosen to include the sensitive lines for each element. The table gives the sensitive lines for these elements, and for twenty others examined by Hartley, Leonard and Pollak, and de Gramont, in order of wave-lengths, with their intensities in spark and arc after Kayser. A bibliography of work on spectrum analysis is also given.

M. H. H.

Sutton (J. R.). *Diamond, a descriptive treatise.* London (T. Murby & Co.), 1928, xii + 118 pp., 36 pls., 3 text-figs. Price 15*s*.

This is scarcely a treatise, but rather a record of the author's own observations made whilst resident in Kimberley, South Africa, during the past thirty-five years. Some of his observations and speculations have been previously published [M.A. **1**–129–30, **1**–379–80; Min. Mag. **19**–208], and some of these he admits have had to be modified. Much of the matter is, however, new. Valuable information is given respecting the external forms, surface characters, aggregations, and inclusions of diamond crystals, and these are well illustrated by pencil sketches. To account for the various forms it is supposed that diamond

separated from the magma as a 'plastic crystal, becoming solid later on', and that interrupted growth took place in depressions on the surface of the eclogite boulders. There seems to be a tendency to enlarge and speculate on the freaks and oddities that have been brought to the author's notice, and in this way the glamour and mystery that have always surrounded diamond is kept up. The book is written in a jerky and argumentative style, and it might have been improved by editing. L. J. S.

Holmes (Arthur). *The nomenclature of petrology.* 2nd edit., London (T. Murby & Co.), 1928, 284 pp. Price 7*s.* 6*d.*

This very useful and handy dictionary of rock names is a reprint page for page by the phototype process of the first edition of 1920 [M.A. **1**–89]. The reproduction is good, though not nearly so clear and sharp as the original; but the main point of interest is that the price is thereby reduced from 12*s.* 6*d.* to 7*s.* 6*d.* In the 'Note to second edition' it is stated that a few necessary corrections and one or two slight modifications have been made. These we have not been able to find on comparing many of the pages, whereas all the misprints previously noted still stand. L. J. S.

Smithson (Frank). *Patterns for the construction of crystal models representing actual minerals.* London (T. Murby & Co.) and New York (D. Van Nostrand Co.), 1928, 4 pp., 24 pls. Price 4*s.*

The set of 36 unfolded drawings of crystals, when mounted on cardboard, cut out, and made up, furnish models of crystals representing the actual forms of various common minerals. It is supplementary to the well-known nets of J. B. Jordan published in 1862 and 1873. L. J. S.

Bailey (Dorothy) & Bailey (Kenneth C.). *An etymological dictionary of chemistry and mineralogy.* London (Edward Arnold & Co.), 1929, viii + 308 pp. Price 25*s.*

This useful book of reference gives an alphabetical list of about 11,000 names of chemical substances and minerals, as well as many descriptive scientific terms. A few trade-names, such as aspirin, bakelite, vaseline, are also included. Under each name or term is given a clear and concise definition, derivation of the word, and a bibliographical reference. The last is usually to some work of reference where further information can be found, but in some cases it is to the original source. The work has been well done and is up-to-date.

names appearing in 1928 being listed. It is well printed, and is singularly free from misprints for a work of this kind. Information respecting minerals has been selected from Dana's 'System', Chester's 'Dictionary', and the 'Mineralogical Magazine', and all mineral names that have appeared in modern English are included.

L. J. S.

New Minerals.

Krenner (József) [1839–1920]. *Két új Magyar ásvány.*—Krenner (Josef). *Zwei neue Minerale aus Ungarn.* [Rhomboklas, Szomolnokit.] Mat. Természettud. Értesítő, Budapest, 1928, vol. 45, pp. 1–7 (Hung.), pp. 8–9 (Germ.), 6 figs.

—— *Berthierit Felsőbányáról.—Berthierit von Felsőbánya.* Ibid., p. 13 (Hung.), p. 14 (Germ. summary.).

Krenner (Josef). *Mineralogische Mitteilungen aus Ungarn.* Centr. Min., Abt. A, 1928, pp. 265–271, 6 figs. [Cf. M.A. **3**–548.]

Zwei neue Mineralien aus Ungarn.—Brief preliminary announcements on rhomboclase and szomolnokite from the pyrites mines of Szomolnok, Hungary [now Smolník, Slovakia] were made in 1891 (see Min. Mag., 1910, vol. 15, pp. 429, 431). 5. *Rhomboklas* (pp. 265–268).—The small flat rhomb-shaped crystals are clear and colourless or grey and opaque. They are orthorhombic with $a : b : c = 0{\cdot}56965 : 1 : 0{\cdot}94644$, and the forms c (001), p (111), m (110), and small d (011), b (010). Optic axial plane (100), $Bx_a \perp$(001), $2H_o$ 137° 9′. Analysis I by J. Loczka gives the formula $Fe_2O_3.4SO_3.9H_2O$. Crystals of this compound were prepared artificially by R. Scharizer in 1901 and 1907 [see also M.A. **2**–21]. 6. *Szomolnokit* (pp. 268–270).—The small yellow to brown crystals have the form of acute bipyramids which are monoclinic with $a : b : c = 0{\cdot}9544 : 1 : 1{\cdot}8999$, $\beta = 86°\ 39'\ 54''$, and the forms p (111), q ($\bar{1}11$), and sometimes small m (110). Optic axial plane (010); sp. gr. 3·035. Analysis II by J. Loczka agrees with $FeSO_4.H_2O$, and the mineral is isomorphous with kieserite [$MgSO_4.H_2O$]. The ferropallidite of R. Scharizer, 1903, has the same composition.

	SO_3.	Fe_2O_3.	FeO.	CuO.	ZnO.	MgO.	CaO.	H_2O.	Total.
I.	49·27	24·54	0·35	0·03	—	—	0·10	(25·54)	100·00
II.	47·96	1·36	39·42	1·20	0·14	0·25	0·07	10·36	101·07

I, also $Mg(Na_2)O$ 0·15, Al trace. II, also $Na_2(K_2)O$ 0·31.

7. *Berthierit von Felsőbánya* (pp. 270–271).—Bundles of needles intimately associated with stibnite differ from this in the light steel-

grey colour on fresh fractures. Sp. gr. 4·622. Analysis by J. Loczka gave S 29·28, Sb 55·96, As trace, Fe 12·61, Cu 0·06, Pb 0·94, Zn 0·24, Mn 0·31, insol. 0·05 = 99·44. L. J. S.

Simpson (Edward S.). *Contributions to the mineralogy of Western Australia. Series iii.* Journ. Roy. Soc. Western Australia, 1928, vol. 14, pp. 45–56, 2 figs.

(1) Tanteuxenite (sp. nov.), Pilbara goldfield, NW. Div.—Derived from pegmatite, this is found in several of the tinfields of the Pilbara goldfield. It is essentially a titanotantalate of yttrium, $YtTi_2TaO_8$, with probably $CaTiTa_2O_8$ and $Yt_2Ta_2O_8$, differing from euxenite in having tantalum in place of niobium and with a corresponding higher specific gravity of 5·4–5·9. It is brownish-black, with sub-conchoidal fracture and resinous lustre, H. 5–6; thin splinters are amber-yellow and optically isotropic. Indistinct crystals are tabular and orthorhombic. Analysis I of material from Cooglegong; II and III, by D. G. Murray, from Woodstock.

	Ta_2O_5.	Nb_2O_5.	TiO_2.	SnO_2.	ThO_2.	$(Yt,Er)_2O_3$.	Ce_2O_3.	$(La,Di)_2O_3$.	UO_3.
I.	47·31	3·83	14·17	0·14	trace	17·48	7·22		3·35
II.	22·95	15·27	21·05	0·44	2·86	16·36	9·40	0·14	4·16
III.	24·84	13·40	20·71	0·42	3·16	16·62	9·04	0·34	4·04

	PbO.	Fe_2O_3.	MnO.	CaO.	Al_2O_3.	Bi_2O_3.	SiO_2.	Na_2O.	ign.	Total.	Sp. gr.
I.	trace	1·18	0·35	2·22	nil	nil	0·90	trace	2·40	100·55	5·77
II.	1·71	1·53	0·28	0·97	0·31	0·04	0·13	nil	2·24	99·84	5·55
III.	1·64	1·48	0·28	0·97	0·61	0·04	0·56	nil	2·16	100·31	5·55

(2) Microlite, Strelley, NW. Div.—Water-worn pebbles from Strelley (formerly Tabba Tabba North) consist of an intergrowth of black tapiolite (68·8 %) and pale-buff to cinnamon microlite (27·3 %). (3) Andalusite from Toodyay, SW. Div.—Crystals (up to 6 cm. long) from mica-schist show the characteristic chiastolite arrangement of carbonaceous inclusions; other crystals show an outer zone of alteration into mica. (4) Grossularite, Mt. Franciso, NW. Div.—Large masses of pale brownish colour gave analysis IV. (5) Spessartite, Tabba and Stannum, NW. Div.—Pale cinnamon-coloured crystals were obtained from a detrital tantalite concentrate at Tabba (anal. V); dark-brown crystals from Stannum gave VI. (6) Andradite, Melville, and Weelhamby Lake.—Large masses of dark-brown andradite from Melville gave VII (including some quartz), and from Weel-

hamby Lake VIII (with a little epidote, quartz, and actinolite). (7) Spodumene, Wodgina, NW. Div.—Grey cleavages from pegmatite gave IX. (8) Cummingtonite, Warriedar, SW. Div.—A grey asbestiform mineral from amphibolite gave X; the fibres usually give straight extinction, but some give extinction-angles up to 15°. (9) Corundum, Abydos, Burbanks, and Balbarrup.—Near Abydos Station, NW. Division, corundum crystals are abundant in chlorite-biotite-schist. Near Burbanks, Central Division, red granular corundum occurs in fuchsite-schist with andalusite and kyanite. Pebbles of yellowish corundum (anal. XI) occur with kyanite and rutile in gravel at Balbarrup, SW. Division. (10) Octahedrite, Kunjin, SW. Div.—The heavy concentrate (0·05 %) from a white pottery clay consists mainly of zircon, together with minute tabular crystals of colourless to brownish anatase.

	SiO_2.	Al_2O_3.	Fe_2O_3.	FeO.	MnO.	MgO.	CaO.	H_2O.	Total.	Sp. gr.
IV.	38·50	18·94	4·90	1·52	0·23	0·49	35·08	0·32	99·98	3·65
V.	36·79	20·40	0·46	6·71	35·87	nil	nil	0·16	100·43	4·18
VI.	35·77	20·38	3·00	18·83	21·84	0·06	0·06	0·16	100·18	4·24
VII.	38·79	0·22	29·38	1·61	0·20	0·01	29·85	0·13	100·20*	3·87
VIII.	38·40	8·27	17·90	1·76	1·38	0·29	31·21	0·32	99·94†	3·59
IX.	64·17	28·08	0·12	0·21	0·18	0·11	nil	0·30	100·49‡	3·17
X.	56·74	0·91	3·14	24·41	1·58	9·72	0·42	3·81	100·73	3·28
XI.	9·04	83·84	3·70	—	—	trace	—	1·44	100·00§	3·88

* Incl. TiO_2 0·01. † Incl. TiO_2 0·41. ‡ Incl. Li_2O 6·70, Na_2O 0·37, K_2O 0·22, TiO_2 0·03. § Incl. TiO_2 1·98.

L. J. S.

Cooper (R. A.). *A new platinum mineral in the Rustenburg norites.* Journ. Chem. Metall. Mining Soc. South Africa, 1928, vol. 28, pp. 281–283.

The concentrate from the platiniferous norites of the Rustenburg district, Transvaal, is soluble in aqua regia only after being heated. Analysis gave Pt 64·2, Pd 9·4, S 17·7, As 7·7 %, the palladium being perhaps foreign. Similar material from the dunite of Onverwacht [Lydenburg district] gave, by J. Craighead, Pt 59·3, S 3·7, As 36·9 %. These analyses give the formula $Pt(As,S)_2$. The colour of the irregular fragments and 'very complex crystal forms' (sometimes rectangular rods) is steel-grey, rather than the tin-white of sperrylite. The mineral appears to be a sulpharsenide of platinum distinct from sperrylite, and in the discussion (p. 283) on the paper F. Wartenweiller tentatively suggests the name *cooperite*. L. J. S.

Ellsworth (H. V.). *I. Thucholite, a remarkable primary carbon mineral from the vicinity of Parry Sound, Ontario. II. Cyrtolite intergrowth associated with the Parry Sound thucholite.* Amer. Min., 1928, vol. 13, pp. 419–441, 3 figs.

—— *Thucholite and uraninite from the Wallingford mine near Buckingham, Quebec.* Ibid., pp. 442–448, 2 figs.

Small nodules of a carbonaceous material, named thucholite (from the components Th, U, C, H, O), occur, usually in intimate association with uraninite and cyrtolite, in pegmatite. It is jet-black, with brilliant lustre and conchoidal fracture; very brittle, H. $3\frac{1}{2}$–4, sp. gr. 1·777. It contains C 45–50·5, H_2O 3·6–13, ash 3·5–28 %. The gas given off at a high temperature consists mainly of hydrogen and carbon monoxide. The radioactive ash contains ThO_2 48·48, U_3O_8 5·80, $(Ce,La,Di)_2O_3$ 5·45, $(Yt,Er)_2O_3$ 10·95, SiO_2 14·70, V_2O_3 2·25, P_2O_5 3·21 % &c. Analyses are given of cyrtolite and uraninite.

L. J. S.

Lausen (Carl). *Hydrous sulphates formed under fumerolic conditions at the United Verde mine.* Amer. Min., 1928, vol. 13, pp. 203–229, 7 figs.

Pyritic ore burned for several years in this mine at Jerome [Arizona], and the crystallized sulphates were probably formed when the mine was flooded with water in the attempts to extinguish the fire. Six new minerals are described. Alunogen as white masses of colourless flakes with $\gamma : c = 40°$ on the (010) cleavage; analysis I, $Al_2O_3.3SO_3 18H_2O$. *Butlerite* as minute orange-yellow crystals; orthorhombic, $a : b : c = 0·9005 : 1 : 1·3606$, of acute pyramidal habit with o (111), r (101), s (302); anal. II, $Fe_2O_3.2SO_3.5H_2O$. Copiapite as minute six-sided scales with monoclinic symmetry; anal. III, $Fe_2O_3.3SO_3.10H_2O$. Coquimbite as colourless to faint lavender or grey crystals with the forms $o\ d\ y\ a\ m$ [Dana's letters]; anal. IV, $2(Fe,Al)_2O_3.7SO_3.22H_2O$. *Guildite* as dark chestnut-brown monoclinic crystals, $a : b : c = 1·037 : 1 : 1·407$, $\beta = 74°\ 43'$, with the forms c (001), a (100), m (110), d (540), k (011), l (101), h ($\bar{1}01$), n ($\bar{3}46$), e ($\bar{1}02$), f (012); anal. V, $3(Cu,Fe)O.2(Fe,Al)_2O_3.7SO_3.17H_2O$. *Louderbackite* as pale chestnut-brown crystalline crusts; optically biaxial; anal. VI, $2FeO.3(Fe,Al)_2O_3.10SO_3.35H_2O$. *Ransomite* as radiating tufts of sky-blue orthorhombic needles, $a : b : c = 1·7407 : 1 : 0·5168$ with the forms a (100), b (010), m (110), n (210), d (301), e (053), o (111), s (211), t (311), and vicinal faces; anal. VII, $CuO.(Fe,Al)_2O_3$.

$4SO_3.7H_2O$. *Rogersite* [1] as white aggregates of minute silky fibres; monoclinic with $a : c = 27°$; anal. VIII, $Fe_2O_3.3SO_3.6H_2O$. Voltaite as black octahedra with $d\,a$ and $q\,(112)$; sp. gr. 2·611, n 1·594 [M.A. **3**–456]. Sulphur is deposited by the gases issuing from the cracked rocks. *Jeromite* as black fused globules on rock crevices from which hot gases are issuing. Thin splinters are cherry-red and optically isotropic; analysis gave S 40·8, Se 7·5, Te trace, As 46·8, Sb trace, insol. in HNO_3 4·9 (diff.), giving the formula $As(S,Se)_2$. Associated with this are minute orange-yellow octahedra which also contain arsenic and sulphur.

	SO_3.	Al_2O_3.	Fe_2O_3.	FeO.	CuO.	Na_2O.	K_2O.	H_2O.	Total.
I.	37·84	13·48	0·52	—	—	2·06	—	45·28	99·37
II.	38·63	0·55	36·31	0·41	—	2·73	—	22·83	101·46
III.	38·45	—	27·12	0·38	2·26	1·74	0·24	31·03	101·22
IV.	44·05	6·93	14·69	—	—	2·13	—	31·72	99·52
V.	39·68	2·11	19·12	1·49	15·78	1·23	—	22·15	101·56
VI.	39·34	2·55	20·84	7·01	—	0·88	—	31·33	101·95
VII.	46·30	1·52	22·57	—	11·29	—	—	18·82	100·50
VIII.	47·90	1·40	28·07	—	—	1·23	0·06	20·64	99·30

Analyses by T. F. Buehrer. I, also CaO 0·19.

	Sp. gr.	H.	α.	β.	γ.	Opt. sign.
I.	1·785	1½–2	1·472	1·479	1·482	'+'
II.	2·548	2½	1·604	1·674	1·731	—
III.	2·092	—	1·525	1·540	1·595	[+]
IV.	2·066	2½–3	1·536(ω)	—	1·572(ϵ)	+
V.	2·725	2½	1·623	1·630	1·684	+
VI.	2·185	2½–3	1·544	1·558	1·581	+
VII.	2·632	2½	1·631	1·643	1·695	+
VIII.	—	—	1·598	1·628	1·654	[−]

L. J. S.

Johansson (K.). *Mineralogische Mitteilungen.* Zeits. Krist., 1928, vol. 68, pp. 87–118, 12 figs.

1. *Gudmundit, ein neues Mineral innerhalb der Markasitgruppe* (pp. 87–91).—This new mineral was found as small silver-white to steel-grey crystals embedded in vein calcite with lead and zinc ore at Gudmundstrop, near Sala, Sweden. In the associated 'skarn' there are crystals of mispickel of similar appearance. Analysis, S 15·47, Sb 57·31, Fe 26·79, Ni trace = 99·57, gives the formula FeSbS, i.e. similar to that of mispickel but with antimony in place of arsenic. The orthorhombic crystals have H. 6 and $a : b : c = 0·6729 : 1 :$

[1] The name 'rogersite' being preoccupied is replaced by lausenite (G. M. Butler, Amer. Min., 1928, vol. 13, p. 594). In the same place it is pointed out that 'jeromite' is similar to arsensulfurite (of F. Rinne, 1902).

1·1868, with the forms m (110), t (013), q (011), c (001); they are elongated along the a-axis and twinned on (110). By corrosion they develop acute pyramids with indices (1.9.24) to (1.14.39). Mispickel from Nordmark, Wermland, containing As 45·77, Fe 31·42, Co 3·07 % gave $a : b : c = 0{\cdot}6730 : 1 : 1868$; from Brodd mine, Säter, containing Co 4·73 %, gave $a : b : c = 0{\cdot}6877 : 1 : 1{\cdot}932$.

2. *Über Zusammensetzung und Kristallographic des Plumboferrits* (pp. 91–102).—Analysis of plumboferrite from Jakobsberg, Wermland, gave PbO 33·03, FeO 0·78, MnO 1·41, CaO 0·40, MgO 0·34, K_2O 0·13, Na_2O 0·17, Fe_2O_3 63·01, Sb_2O_3 0·25, TiO_2 0·08, insol. 0·15 = 99·75, corresponding with the formula $PbO{\cdot}2Fe_2O_3$. Sp. gr. 6·07. Crystals are trigonal with $a : c = 1 : 3{\cdot}9719$, and a thick-tabular development parallel to the basal cleavage. X-ray examination shows the symmetry to be trigonal trapezohedral and the space-group probably D_3^1. The hexagonal parallelepiped cell, of dimensions $a = 11{\cdot}82$, $c = 47{\cdot}11$ Å., contains 42 molecules (504 atoms), and this unusually high number is perhaps related to the peculiar development of the crystals.

3. *Hämatophanit* (pp. 102–107).—This new mineral haematophanite occurs together with plumboferrite at Jakobsberg as lamellar aggregates of thin plates with micaceous cleavage. The colour is dark reddish-brown with semi-metallic lustre and yellowish-red streak. Very thin flakes are translucent with blood-red colour and are optically negative. H. 2–3, sp. gr. 7·70. The mineral is readily soluble in dilute HCl. Analysis gave PbO 73·26, FeO 0·22, MnO 0·29, CaO 0·26, MgO 0·06, K_2O 0·17, Na_2O 0·38, Fe_2O_3 22·01, $FeTiO_3$ 0·20, Cl 2·17, H_2O 0·73, insol. 0·42, total (less O for F) 99·68, corresponding with $Pb(Cl,OH)_2{\cdot}4PbO{\cdot}2Fe_2O_3$. X-ray examination shows the crystals to be holohedral tetragonal with the unit cell dimensions $a = 7{\cdot}801$, $c = 15{\cdot}23$ Å. ($c/a = 1{\cdot}952$) containing four molecules.

4. *Jacobsit* (pp. 107–118).—Small (1 mm.) grains of jacobsite in calcite from Jakobsberg, with sp. gr. 4·76, gave on analysis Fe_2O_3 73·96, FeO 2·57, MnO 13·94, MgO 9·26, TiO_2 0·09, total 99·82, from which the formula $MgFe_2O_4 + (Mn,Fe)Fe_2O_4$ or $MgMn(Fe_2O_4)_2$ is deduced. The light-figure on the octahedral faces is unsymmetrical, and there are faces of the pentagonal-icositetrahedra (871) and (781) together with other irregularly distributed faces. The crystal-class is thus plagihedral cubic. X-ray examination gives the space-group as O_4 and the unit cube of edge $a = 8{\cdot}42$ containing four molecules $MgMn(Fe_2O_4)_2$. A yellow-green garnet sp. gr. 3·84 associated with

the jacobsite is shown by analysis to be andradite: SiO_2 35·45, Al_2O_3 0·45, Fe_2O_3 30·36, FeO 0·72, MnO 0·16, CaO 32·56, MgO 0·14, total 99·84. L. J. S.

Zambonini (F.) & Carobbi (G.). *Sulla presenza, tra i prodotti dell'attuale attività del Vesuvio, del tetraclorocupriato potassico diidrato* $K_2CuCl_4.2H_2O$. Ann. R. Osservatorio Vesuviano, 1925, ser. 3, vol. 2, pp. 7–9.

A small stalactite consisting mainly of chlorides and sulphates of potassium and sodium, collected in 1920 on the floor of the crater of Vesuvius, shows on the surface minute greenish-blue crystals and grains which were found to contain potassium, cupric chloride, and water. No other elements were detected spectroscopically. The specific gravity 2·418 agrees with that (2·416) determined for the artificial salt $K_2CuCl_4.2H_2O$. The optically uniaxial and negative crystals are tetragonal with the forms *a* (100) and *o* (111), and they are of two habits according to the predominance of one or other of these forms. Measured angles agree with the constants determined by G. Wyrouboff (1887) for the artificial salt [$a : c = 1 : 0{\cdot}7525$]. This salt was prepared by E. Mitscherlich in 1840, and the new mineral is named *mitscherlichite*. It is associated with small cubes of sylvine, hexagonal scales of metavoltine, and tufts of gypsum crystals.

L. J. S.

Ramdohr (Paul). *Klockmannit, ein neues natürliches Kupferselenid.* Centr. Min., Abt. A, 1928, pp. 225–232.

Associated with umangite from Sierra de Umango, Argentina, and also from Lerbach, Harz, and Skrikerum, Sweden, is another copper selenide which is named klockmannite. On freshly fractured surfaces of the granular material the former is reddish-violet and the latter slate-grey; both are strongly pleochroic in reflected polarized light, and both tarnish to blue-black. Analyses gave, after deducting about 50 % of impurities, the formula Cu_3Se_2 for umangite and CuSe for klockmannite. The latter shows a basal cleavage, and is perhaps hexagonal and isomorphous with covelline. L. J. S.

Harbort (E.). *Über Zirklerit. Ein neues durch Thermo-Dynamo-metamorphose gebildetes Mineral aus einigen Salzstöcken der norddeutschen Tiefebene.* Kali und verwandten Salze, Halle, 1928, vol. 22, pp. 157–161, 1 pl.

Zirklerite forms an intimate mixture (rock) with halite, clay,

anhydrite, rinneite, minute bipyramids of quartz, dolomite, and chlorite. It has been found in the Adolfsglück mine at Hope in Hannover, and in some other north German potash-salt mines. On exposure to moist air it becomes covered with a film of ferric hydroxide. The mineral has a rhombohedral cleavage, and is optically uniaxial and positive with birefringence higher than that of rinneite [$FeCl_2.3KCl.NaCl$], and lower than that of koenenite [$3MgCl_2.3MgO.Al_2O_3.6H_2O$]. Mean n 1·552, sp. gr. about 2·6, H. about $3\frac{1}{2}$. Deducting 52 % of impurities, analysis gave Al_2O_3 12·29, $CaCl_2$ 2·47, $MgCl_2$ 6·83, $FeCl_2$ 57·20, H_2O 21·23, corresponding with $2\{Al_2O_3.H_2O\} + 9\{(Fe,Mg,Ca)Cl_2.2H_2O\}$. The mixture of minerals owes its origin to the metamorphism of salt-clay. L. J. S.

Schoep (Alfred). *Over juliëniet, een nieuw mineraal.—La juliéniete, nouvelle espèce minérale.* Natuurwetenschapplijk Tijdschrift, Antwerpen, 1928, vol. 10, pp. 58–59. [Flemish with French résumé.]

This forms thin crusts of minute blue needles in a white talc-schist, containing also a black copper-cobalt mineral, from Chamibumba, near Kambove, Katanga. Under the microscope it resembles connellite and buttgenbachite [M.A. **3**–372] and is presumably hexagonal; ϵ 1·645, ω 1·556. It readily dissolves in cold water to a rosy solution, and contains Co, Cl, N_2O_5, and H_2O, and the mineral appears to correspond with buttgenbachite with cobalt in place of copper.

L. J. S.

Schoep (Alfred). *La renardite, nouveau minéral uranifère.* Bull. Soc. Franç. Min., 1928, vol. 51, pp. 247–252, 2 figs.

A yellow mineral occurring with dewindtite, dumontite, and torbernite in the uranium ore of the Kasolo mine, Katanga, was found to differ from dewindtite in its optical characters. The minute crystals are orthorhombic and flattened on the perfect cleavage (100) with narrow faces of (010) and (101); $a : c = 1 : 0{\cdot}8327$. The optic axial plane is (001), Bx_a negative $\perp$ (100); α 1·715, β 1·736, γ 1·739; sp. gr. just over 4. Analysis, P_2O_5 8·15, UO_3 64·82, PbO 12·26, $Fe_2O_3 + Al_2O_3 + CoO$ 3·68, MoO_3 0·74, H_2O 8·74 (at 110°, 4·97), insol. 2·11 = 100·50, gives the formula $PbO.4UO_3.P_2O_5.9H_2O$. These characters are compared with those of the other lead uranium phosphates, parsonsite, dumontite, and dewindtite, from the same locality.

L. J. S.

Duparc (L.). *Sur une amphibole du groupe de la glaucophane.* Compt. Rend. Soc. Phys. Hist. Nat. Genève, 1927, vol. 44, pp. 48–49.

An amphibole in a quartzite from the Ural shows a nucleus with the optical characters of ordinary glaucophane (I) surrounded by a thin darker zone with different characters (II). The acute negative bisectrix (α through (100)) coincides, but β and γ are interchanged, and the optic axial planes are at right angles in the two portions. This *pseudoglaucophane* has also been found in a crystalline schist (containing much calcite with epidote, albite, sericite, &c.) from Switzerland (III). The pleochroism is γ dark violet, β darker blue, α pale yellow.

	Op. ax. pl.	Extn. on (010).	2V.	$\gamma-\alpha$.	$\gamma-\beta$.
I.	(010)	$c:\gamma = 4°$	0°–small	0·0172	0·001
II.	$\perp$(010)	$c:\beta = 5$–$6°$	—	$<$0·017	—
III.	$\perp$(010)	$c:\beta = 6°$	40°	0·014	0·0015

L. J. S.

Palache (C.), Bauer (L. H.), & Berman (H.). *Larsenite, calcium-larsenite and the associated minerals at Franklin, New Jersey.* Amer. Min., 1928, vol. 13, pp. 334–340, 1 pl.

The results previously published [M.A. **3**–469] are set out in rather fuller detail. L. J. S.

X-rays and Crystal-structure.

Vegard (L.). *Die Röntgenstrahlen im Dienste der Erforschung der Materie.* Zeits. Krist., 1928, vol. 67, pp. 239–259.

A general review of the work accomplished in the Physical Institute at Oslo on the structure of crystals by X-ray methods. L. J. S.

Morse (Jared Kirtland). *Bibliography of crystal structure.* Chicago (University of Chicago Press), 1928, xix + 164 pp., 1 pl., 7 text-figs. Price $3·00.

A brief account is given of the scope and aims of the Crystal Structure Laboratory attached to the Department of Physics in the University of Chicago. This is followed by reprints of six papers (five by J. K. Morse) from scientific journals on work done in the laboratory. The bibliography (Part II, pp. 37–164) gives under each year, from 1912 to 1927, the titles of papers arranged alphabetically according to authors. This is on the same lines as the bibliography of R. W. G. Wyckoff [M.A. **2**–321], which appears to have been extended as a card-index by copying the mutilated titles from abstract

journals. Some papers not dealing with structure are quoted, whereas many that do are omitted. Without an index of authors and subjects such a bibliography arranged under years (dates of publication ?) is of little use. L. J. S.

Arkel (A. E. van). *Eine einfache Methode zur Erhöhung der Genauigkeit bei Debye-Scherrer-Aufnahmen.* Zeits. Krist., 1928, vol. 27, pp. 235–238.

A formula is given for correction of errors in Debye-Scherrer powder photographs due to uncertainties in the position of the film, size of the camera, &c. H. H.

Herrmann (K.). *Röntgenographische Auslöschungstabellen.* Zeits. Krist., 1928, vol. 68, pp. 288–298, 1 fig.

A table is drawn up by means of which the faces giving X-ray reflections in each space-group may be determined. Another table is added for use in the orthorhombic system, to give the effect of interchange of any two crystallographic axes. The author claims that, though this table is similar to those already published by Astbury and Yardley, Niggli, Mark, and Wyckoff, it is more convenient in practice. H. H.

Edelman (C. H.) & Willems (H. W. V.). *Statistische Methoden zur Bestimmung von Kristallstrukturparametern.* Zeits. Krist., 1928, vol. 67, pp. 177–188, 10 figs.

The fact that one X-ray reflection is more intense than another puts upper and lower limits to the possible values of the structure-parameters of the atoms of a crystal. By taking in succession other pairs of reflections these possible values may be confined between closer and closer limits, until the values of these parameters are known approximately. The method is illustrated by applications to the structure of cinnabar and millerite. H. H.

Bragg (W. Lawrence) & West (J.). *A technique for the X-ray examination of crystal structures with many parameters.* Zeits. Krist., 1928, vol. 69, pp. 118–148, 2 figs.

When the size of the unit-cell, the intensity and wave-length of X-ray radiation, and the angle of incidence are known, the energy of the reflected radiation as measured by the spectrometer method from any given crystal plane is proportional to F^2, where F is a function solely of the distribution of the atoms in the unit cell. The accuracy

of any suggested distribution may be tested by comparison of the values of F as obtained by calculation and observation, and the method proves applicable to the determination of the atomic arrangement of quite complicated structures. The difficulties introduced by absorption and extinction are considered, as well as the possibility of determining structures by a Fourier analysis. H. H.

Bragg (W. Lawrence), Darwin (C. G.), & James (R. W.). *The intensity of reflexion of X-rays by crystals.* Phil. Mag., 1926, ser. 7, vol. 1, pp. 897–922.

A review of theoretical and experimental work since 1914 on the intensity of reflection of X-rays by crystals is given. Formulae for calculating the integrated intensity of reflection for ideally perfect and ideally imperfect or mosaic crystals have been deduced. The object of the paper is to discuss which type of formula should be applied to actual crystals. Observations were made at small reflection angles, in order to reduce to a minimum the uncertainty of such factors as temperature, &c., factors only approximately known. Halite, fluorite, and baryte appear to approximate closely to the mosaic type, while calcite is intermediate. It is pointed out how a knowledge of the scattering-power of the atom, together with the type of formula to be used in any given case, will aid in the investigation of complex structures. Evidence as to electronic distribution in the atom is also given by the scattering-power of the atom; and lastly, the latter leads to an evaluation of primary and secondary extinction, quantities necessary to gauge the degree of imperfection of a crystal.

F. A. B.

Mayer (Georg). *Über Aufhellungen in Röntgenspektrogrammen.* Zeits. Krist., 1928, vol. 66, pp. 585–636, 23 figs.

The interaction of the waves scattered by the atoms of a crystal can be shown, on the basis of the dynamical theory, to lead to the reinforcement of a principal interference by one or more secondary interferences. The conditions of production of the 'Aufhellung' are discussed, using the conception of the reciprocal lattice. A theodolite ionization spectrometer is employed to detect and study the reinforcement of the principal reflection of (040) by the secondary reflections of (220) and ($2\bar{2}0$) for diamond. The observed results are in agreement with theory. The height and breadth of the 'Aufhellung' are dependent upon the degree of imperfection of the crystal and the divergence of the incident beam. Integrated measurements are pre-

ferable, therefore, since they are independent of these factors. In a detailed mathematical study it is then shown that the dynamical theory gives quantitative agreement. Comparisons are also made with Berg's work on the same subject (Wiss. Veröffentl. Siemens-konzern, 1926, vol. 5, p. 89). The theoretical discussion involves a detailed treatment of the 'dispersion surface' (analogous to Fresnel's ellipsoid for doubly-refracting media). F. A. B.

Patterson (A. L.). *Über die Messung der Größe von Kristallteilchen mittels Röntgenstrahlung.* Zeits. Krist., 1928, vol. 66, pp. 637-650, 4 figs.

Assuming that the particles making up a crystalline powder are equal in size, Laue, in 1913, deduced a relation between the breadth of the interference lines produced when X-rays are reflected from the powder, and the size of the constituent particles. The breadth of a line is defined as the ratio of the integrated intensity of the reflection to its maximum intensity. The author extends this calculation to the case where the size of the particles varies according to Maxwell's distribution law. He finds that by measuring the breadth of the lines the mean reciprocal value of the sizes of the particles can be calculated. However, the relation between the required mean value and the mean reciprocal value is dependent upon the unknown size distribution of the particles. The influence of irregularities in the space lattice upon the breadth of the interference lines is also discussed. In conclusion, it is deduced that the determination of the size of the particles cannot be used to confirm a structure incompletely known, since both are interdependent. F. A. B.

Brill (Rudolf). *Teilchengrößenbestimmungen mit Hilfe von Röntgenstrahlen.* Zeits. Krist., 1928, vol. 68, pp. 387–403, 1 pl., 8 text-figs.

Scherrer has given a formula connecting the breadth of X-ray interference lines and the magnitude of the constituent particles of a substance; while Laue gives a similar formula for the relative widths of different Debye-Scherrer rings. The author applies their methods to particles of iron prepared in various ways, and obtains results from the two formulae which are in reasonable agreement. He points out that Scherrer's formula is only suitable for the case in which relatively small particles are present, and in which a strongly absorbing material is under discussion. H. H.

James (R. W.). *The influence of temperature on the intensity of reflexion of X-rays from rocksalt.* Phil. Mag., 1925, ser. 6, vol. 49, pp. 585–602, 1 fig.

The ratios of the intensities of reflection of X-rays from the face (100) of rock-salt at various temperatures to that at room-temperature were measured for different orders. The observations extended over a range, 290°–900° absolute. The results agree with the general theoretical expression of Debye for the temperature coefficient, but experiment shows that M, the exponent of this coefficient, is proportional to the square of the absolute temperature. According to Debye's theory, above 50° absolute, M should be directly proportional to the absolute temperature. The intensity diminishes much more as the temperature rises than theory indicates. F. A. B.

James (R. W.) & Firth (Elsie M.). *An X-ray study of the heat motions of the atoms in a rock-salt crystal.* Proc. Roy. Soc. London, Ser. A, 1927, vol. 117, pp. 62–87, 7 figs.

The ratio of the intensity of reflection of X-rays by rock-salt at the temperature of liquid air, to that at room-temperature, was measured for a number of spectra. These results, together with the observations at high temperature (see preceding abstract), are compared with the theoretically deduced temperature coefficient of Debye and Waller. Up to about 500° absolute the measurements agree fairly well with Waller's theory, but above that temperature the intensity decrease is more rapid than theory indicates. Absolute values for the integrated reflection from various faces of rock-salt have been redetermined for two wave-lengths and the atomic amplitude factor, F, deduced for the atoms of sodium and chlorine at various temperatures. By combining these results with those obtained for the temperature coefficient the authors determine the distribution of electrons in rock-salt at various temperatures and hence obtain a direct estimate of the amplitude of vibration of the atoms. F. A. B.

Waller (Ivar) & James (R. W.). *On the temperature factors of X-ray reflexion for sodium and chlorine in the rock-salt crystal.* Proc. Roy. Soc. London, Ser. A, 1927, vol. 117, pp. 214–223, 2 figs.

In comparing the measurements of the temperature coefficient for rock-salt at high and low temperatures with theory (see preceding abstract), it was assumed that the lattice consists of only one kind of atom. The authors calculate two different temperature factors for

sodium and chlorine, using an expression involving the elastic constants of rock-salt. Thence it is calculated that the root-mean-square amplitudes of the sodium and chlorine atoms in rock-salt at 290° absolute are 0·242 Å. and 0·217 Å. respectively. In addition, from the measurements at low temperature the elastic constants of rock-salt are calculated; they agree closely with the direct determinations of Voigt. If allowance is made for the different temperature factors of sodium and chlorine, the Debye-Waller theory accounts quantitatively for the variation in intensity, in the case of rock-salt, from 86° to 500° absolute. F. A. B.

James (R. W.) & Brindley (G. W.). *A quantitative study of the reflexion of X-rays by sylvine.* Proc. Roy. Soc. London, Ser. A, 1928, vol. 121, pp. 155–171, 4 figs.

For sylvine the variation of the intensity of reflection of X-rays with temperature agrees quantitatively with the Debye-Waller theory from the temperature of liquid air up to about 400° absolute. Above this temperature, as in the case of rock-salt, the exponent of the temperature coefficient varies as the square of the absolute temperature. The experimental value of the temperature factor calculated from measurements at room-temperature and the temperature of liquid air is in close agreement with the value deduced using the elastic constants of the crystal, and also with the value calculated from the Debye-Waller law. The absolute values for the intensity of reflection are also concordant with recent theory. F. A. B.

Burgers (W. G.). *Investigations of the molecular arrangement of uniaxial optically active crystals.* Proc. Roy. Soc. London, Ser. A, 1927, vol. 116, pp. 553–586, 12 figs.

Crystals of four uniaxial optically active substances were investigated by X-rays to find out whether they are pseudo-symmetrical intergrowths of biaxial lamellae, arranged spirally. The X-ray photographs showed the crystals to be single, and it was concluded that in all the above cases rotatory power is due to some special arrangement of atoms within a unit of structure. Potassium lithium sulphate is a possible exception and is discussed separately. The space-groups or 'pseudo' space-groups were then determined, and an attempt made at correlation between the rotatory power and the spiral arrangements within the unit. Further points of discussion

include a consideration of the marked difference in rotatory power of tetragonal pyramidal and tetragonal trapezohedral crystals.

F. A. B.

Ehrenberg (W.), Ewald (P. P.), & Mark (H.). *Untersuchungen zur Kristalloptik der Röntgenstrahlen.* Zeits. Krist., 1928, vol. 66, pp. 547–584, 7 figs.

The main object of the work is to find out what part is played by the atomic amplitude factor in X-ray interference phenomena by studying the most perfect crystals obtainable. The English and American physicists have investigated intensity relations for crystals such as rock-salt and calcite, in which cases corrections have to be made for absorption, mosaic character, &c. The authors attack the problem by using the most perfect diamond they could obtain. Its small absorption, negligible Debye effect, and simple structure render it most suitable for such work. It was hoped that the deviations in the experimental results from those values to be expected on the basis of the dynamical theory for an ideal crystal, would give information on the atomic amplitude factor alone. Methods are first described to study the shape of the reflection curve in the immediate neighbourhood of the best reflection position of the crystal. Various crystals were tested by 'divergence' measurements, and from the values found for diamond and blende the natural line breadth was calculated. The diamonds selected by this method were then investigated fully by the double spectrometer method of Bergen-Davis (Phys. Rev., 1921, vol. 17, p. 602). It is found that diamond, except for the highest orders, approaches the ideally perfect crystal, and, in any case, is more perfect than the best calcite. The authors then study the relation between the reflecting power and the order of interference; two methods of investigation are discussed, the 'peak' method and the method of uniform rotation. The results agree very well with theory for angles of incidence less than 45°. A surprising disagreement is found, however, for angles greater than 45°. The intensity of reflection is proportional to the structure amplitude in these measurements, a result only to be expected for a perfect crystal. Intensity measurements on diamond at the temperature of liquid air show that the influence of the heat motion of the atoms upon the intensity is negligible. Thus experimental deviations from the formula for the ideal crystal, in the case of diamond, must be related to two factors only, the mosaic factor and the atomic amplitude

factor. For high orders of interference diamond does not behave as a perfect crystal and a separation of the two factors is impossible. The atomic amplitude factor, however, decreases considerably for high orders. For low orders, on the other hand, this factor is the important one. An independent proof is furnished by a photograph of the 'forbidden' reflection for diamond (222). F. A. B.

Lennard-Jones (J. E.) & Dent (Beryl M.). *The change in lattice spacing at a crystal boundary.* Proc. Roy. Soc. London, Ser. A, 1928, vol. 121, pp. 247–259, 1 fig.

It is calculated that the contraction of the lattice at the boundary (100) of crystals of the NaCl type is confined almost entirely to the top layer, and is of the order of 5 %. An upper limit of 5 % is also found for the decrease in interatomic spacing in the surface layer. Recent experiments on the scattering of slow-moving electrons by metallic crystals were at first explained by assuming excessive lattice contraction at the surface of the crystal. However, it is now thought that the results can be explained by supposing the electrons to be refracted in the optical sense. The author's work is additional evidence for this view. A list of calculated values of the surface tension of several halogen salts of sodium and potassium is given.

F. A. B.

Ponte (M.). *On the reflecting power of the carbon atom for high-frequency rays.* Phil. Mag., 1927, ser. 7, vol. 3, pp. 195–209, 6 figs.

By investigating diamond powder with the ionization spectrometer the author obtains a structure factor of $1/\sqrt{2}$ for the amplitude and observes that the intensity of reflection varies with the angle of reflection in the same way for many wave-lengths. Having eliminated the hitherto indeterminate factor, primary extinction, by using the powder method, it follows, from the structure factor obtained, that though a few diamonds are nearly perfect, they too are generally imperfect, and the small blocks of the powder are not perfect crystals. In order to get reflecting powers for the carbon atom for reflecting angles nearer to zero, the author also investigated anthracene, naphthalene, and graphite powders. The plotted values showed that 'f' approached a limiting value of 6 for small reflecting angles. The value for zero angle of reflection should be 6, since this is the number of electrons in a carbon atom. These absolute measurements, however, do not yet permit of any definite conclusions on the electronic distribution within the carbon atom. F. A. B.

Arkel (A. E. van) & Basart (J.). *Atomabstände in Mischkristallen von Gold und Kupfer.* Zeits. Krist. 1928, vol. 68, pp. 475–476.

The observations of Vegard [M.A. 3–522] on the distances between the atoms in alloys of gold and silver were verified by another, and more exact, method. H. H.

Halla (F.) & Staufer (R.). *Nachträgliches zur Arbeit » Röntgenographische Untersuchungen im System Blei-Thallium «.* Zeits. Krist., 1928, vol. 68, pp. 299–300.

A correction is given of a passage in a paper by the authors [M.A. 3–524]. H. H.

Sekito (Sinkiti). *X-ray investigation of the density of quenched steels and the internal stress existing within them.* Zeits. Krist., 1928, vol. 67, pp. 285–294, 7 figs.

Ten specimens of quenched steel, containing 0·1 to 1·0 % of carbon, were submitted to X-ray analysis in order to determine whether the decrease in density caused by quenching was due to internal stress, gaps between small crystalline particles, or expansion of the lattice. The last theory appears most probable, though internal stress exists of the same order of magnitude as the tensile strength. H. H.

Sekito (Sinkiti). *X-ray investigation of the internal stress of carbon steels.* Zeits. Krist., 1928, vol. 67, pp. 563–569, 5 figs.

The investigation is an extension of experiments on cold-drawn copper and quenched carbon steels (Sci. Rep. Tôhoku Univ., 1927 and 1928, vols. 16 and 17) to the case of cold-drawn carbon steels. The broadening of the spectral lines points to a maximum distortion of about 0·4 % in the space-lattice, which disappears on annealing at 400° C. The calculated maximum internal stress is a little less than the tensile strength. H. H.

Ôsawa (Atomi) & Ogawa (Yoshiki). *X-ray investigation of iron and zinc alloys.* Zeits. Krist., 1928, vol. 68, pp. 177–188, 3 figs.

The Fe–Zn alloys were analysed by the powder method for all proportions of zinc to iron. Their crystal structure has a close similarity with that of the Ag–Zn, Cu–Zn, and Au–Zn alloys. Two intermetallic compounds were found. One is Fe_3Zn_{10}, and is cubic, with a unit cell containing 52 atoms and having an edge of length 8·93 Å. The other is $FeZn_7$. It is hexagonal, and has the form of a close-packed lattice with an axial ratio of about 1·60. H. H.

Brill (Rudolf). *Das Kristallgitter des Fe_4N.* Zeits. Krist., 1928, vol. 68, pp. 379–384, 2 figs.

Iron nitride, Fe_4N, is a cubic substance whose unit cell has an edge of 3·80 Å., and contains one molecule. The evidence is consistent with two possible arrangements of the atoms in the cell, in one of which the iron atoms are equivalent and in the other non-equivalent; the latter hypothesis being the more probable.

H. H.

Ôsawa (Atomi) & Iwaizumi (Shujirô). *X-ray investigation of iron and nitrogen alloys.* Zeits. Krist., 1928, vol. 69, pp. 26–34, 4 figs.

Two iron-nitrogen compounds exist. Of these Fe_4N has a cubic unit cell containing one atom of nitrogen with edge 3·86 Å ; while FeN has a hexagonal unit cell containing one atom of nitrogen with $a = 2{\cdot}743$ Å. and $c/a = 1{\cdot}59$. H. H.

Hägg (Gunnar). *Röntgenographische Studien über die binären Systeme von Eisen mit Phosphor, Arsen, Antimon und Wismut.* Zeits. Krist., 1928, vol. 68, pp. 470–472.

Fe_3P has a tetragonal unit cell containing eight molecules and with edges $a = 9{\cdot}090$ and $c = 4{\cdot}446$ Å. The space-group is probably S_4^2. Fe_2P has a hexagonal unit cell containing three molecules with edges $a = 5{\cdot}852$ and $c = 3{\cdot}453$ Å. It belongs to the class D_{6h}. Powder photographs give for Fe_2As a tetragonal unit cell containing four molecules with $a = 5{\cdot}129$ and $c = 5{\cdot}973$ Å., but this requires confirmation. FeAs has an orthorhombic unit cell containing four molecules with edges of 3·366, 6·016, and 5·428 Å. $FeSb_2$ has an orthorhombic cell containing two molecules with edges 3·189, 5·819, 6·520 Å. The most probable space-group is V_h^{12}. Iron and bismuth do not combine in the solid state. H. H.

Seyfarth (Hellmut). *Die Struktur des Zirkoniumsilicids ($ZrSi_2$).* Zeits. Krist., 1928, vol. 67, pp. 295–328, 7 figs.

$ZrSi_2$ has holohedral orthorhombic symmetry. The unit cell contains four molecules and has dimensions given by $a = 3{\cdot}72$, $b = 14{\cdot}61$, $c = 3{\cdot}67$ Å. H. H.

Jong (W. F. de). *Marmatit und Christophit.* Zeits. Krist., 1928, vol. 66, p. 515.

These minerals, proved by microscopical examination to be homogeneous, were examined by the X-ray powder method and found to have the same structure as blende. They no doubt represent mixed crystals of ZnS and FeS, rather than the compound Zn_2FeS_3 (or

$ZnFeS_2$), but the X-ray results do not decide this point. The following results were obtained :

	Zn.	Fe(+Mn).	S.	*a*.
Blende (Santander) ...	1	0	1	5·395 Å.
Marmatite (St. Barbara) ...	0·73	0·27	1	5·415
Christophite (Breitenbrunn)	0·66	0·34	1	5·420

L. J. S.

Jong (W. F. de) & Willems (H. W. V.). *Over de structuur van cinnaber.* Physica, Nederl. Tijds. Natuurk., 1926, vol. 6, pp. 129–136, 5 figs.

Powder photographs gave a cell of dimensions $a = 4{\cdot}12$, $c = 9{\cdot}43$ Å., containing three molecules HgS. The space-group is D_3^4 or D_3^6.

L. J. S.

Jong (W. F. de) & Willems (H. W. V.). *Verbindingen met het tralietype van pyrrhotien (FeS).* [Compounds with the lattice type of pyrrhotine.] Physica, Nederl. Tijds. Natuurk., 1927, vol. 7, pp. 74–79.

X-ray data are given for the compounds CrS, CrSe, CrAs, (MnS and MnSe, cubic), MnAs, MnSb, FeS, (FeAs, orthorhombic), FeSb, CoS, CoSe, CoTe, CoSb, NiS, NiSe, NiTe, NiAs, NiSb. Arite, Ni(As,Sb), is a mixed crystal with $a = 3{\cdot}80$, $c = 5{\cdot}20$ Å. L. J. S.

Willems (H. W. V.). *Over de structuur van milleriet.* Physica, Nederl. Tijds. Natuurk., 1927, vol. 7, pp. 203–207, 2 figs.

Millerite examined by the powder method gave a unit rhombohedral cell $a = 5{\cdot}655$ Å., $\alpha = 116° 35'$, containing three molecules NiS. The space-group is probably C_{3v}^5. The results are compared with those of N. Alsén, 1925 [M.A. **3**–20]. L. J. S.

Haase (Max). *Über die Gitterkonstante des Bariumtellurid.* Zeits. Krist., 1928, vol. 68, pp. 119–122.

The lattice constants of BaTe obtained in powder photographs with copper and mobydenum radiation are compared. They are respectively $a = 6{\cdot}82 \pm 0{\cdot}02$ and $6{\cdot}86 \pm 0{\cdot}04$ Å. H. H.

Jong (W. F. de). *Bepaling van de absolute aslengten van markasiet en daarmede isomorfe mineralen.* [Determination of the absolute axis lengths of marcasite and therewith isomorphous minerals.] Physica, Nederl. Tijds. Natuurk., 1926, vol. 6, pp. 325–332.

Data from X-ray powder photographs are given for marcasite ($a = 6{\cdot}79$, $b = 4{\cdot}45$, $c = 5{\cdot}42$ Å.), mispickel ($a = 6{\cdot}44$, $b = 4{\cdot}76$,

$c = 5{\cdot}63$ Å.), glaucodote ($a = 6{\cdot}67$, $b = 4{\cdot}81$, $c = 5{\cdot}73$ Å.), löllingite, safflorite, and rammelsbergite ($a = 6{\cdot}35$, $b = 4{\cdot}86$, $c = 5{\cdot}80$ Å.).

L. J. S.

Machatschki (Felix). *Präzisionsmessungen der Gitterkonstanten verschiedener Fahlerze. Formel und Struktur derselben.* Zeits. Krist., 1928, vol. 68, pp. 204–222, 1 fig. [Cf. M.A. **3**-426.]

Further discussion on the chemical formula of fahlerz and more X-ray measurements on material from several localities [but no chemical analyses or specific gravity determinations are given of the materials examined]. Cu-Sb-fahlerz has $a = 10{\cdot}32$ Å., this increasing to 10·40 Å. when much silver replaces copper, and decreasing to 10·19 Å. when arsenic replaces antimony in the formula $R'_3R'''S_3$. The results of W. F. de Jong (1928), giving the space-group T'_d and one molecule Cu_3SbS_4 in the unit cell of edge $a = 5{\cdot}15$ Å., are criticized. [Cf. M.A. **3**–525.] L. J. S.

Jong (W. F. de). *Die Enargitgruppe. Struktur des Sulvanit, Cu_3VS_4.* Zeits. Krist., 1928, vol. 68, pp. 522–530, 5 figs.

Enargite (Cu_3AsS_4) and famatinite (Cu_3SbS_4) are isomorphous, with nearly equal lattices. Sulvanite belongs to the space-group O_h^5 and has a cubic unit cell containing eight molecules of Cu_3VS_4 with an edge of 10·75 Å. H. H.

Pauling (Linus). *Note on the pressure transitions of the rubidium halides.* Zeits. Krist., 1928, vol. 69, pp. 35–40, 1 fig.

The three salts RbCl, RbBr, RbI, have the NaCl structure at ordinary pressures, but at a pressure of 5000 kg/cm² their structure undergoes a change with a decrease in volume of about 12 %. The author considers it probable that the new structure is the 'caesium chloride' type, for the volume contraction is about that observed in CsCl, CsBr, CsI when undergoing a similar transition. H. H.

Bräkken (H.) & Harang (L.). *Zur Kristallstruktur einiger rhombischer Verbindungen MX_2. I.* Zeits. Krist., 1928, vol. 68, pp. 123–138, 3 figs.

Powder and rotation methods proved the space-group of $PbCl_2$, $PbBr_2$, and $HgCl_2$ to be V_h^{16}, and showed that the unit cell contains four molecules. The edges of this unit cell are respectively $a = 4{\cdot}50$, $b = 7{\cdot}67$, $c = 9{\cdot}15$; $a = 4{\cdot}71$, $b = 7{\cdot}99$, $c = 9{\cdot}47$; and $a = 4{\cdot}31$, $b = 5{\cdot}94$, $c = 12{\cdot}67$ Å. H. H.

Leonhardt (J.). *Das Raumgitter des Carnallits.* Fortschr. Min. Krist. Petr., 1927, vol. 12, p. 51; Centr. Min., Abt. A, 1927, pp. 381–382; Zeits. Krist., 1928, vol. 66, pp. 506–507.

Orthorhombic crystals of carnallite show a pronounced pseudo-hexagonal symmetry about the *c*-axis and also less pronounced about the *b*-axis. Laue and rotation X-ray photographs give a unit cell, $a = 9{\cdot}53$, $b = 16{\cdot}08$, $c = 22{\cdot}25$ Å., containing twelve molecules of $KCl.MgCl_2.6H_2O$. The space-group is V_h^6. L. J. S.

Gossner (B.). *The crystal form of boleite.* Amer. Min., 1928, vol. 13, pp. 580–582.

Preliminary results are given of the X-ray examination of crystals of boleite showing optically isotropic and anisotropic areas. The structure is cubic with about 32 molecules $PbCl_2.Cu(OH)_2$ in a unit cube of edge $a = 15{\cdot}6$ Å. L. J. S.

Ewing (F. J.) & Pauling (Linus). *The crystal structure of potassium chloroplatinate.* Zeits. Krist., 1928, vol. 68, pp. 223–230, 3 figs.

Crystals of K_2PtCl_6 were investigated by spectral and Laue photographs in order to clear up discrepancies in earlier work on this substance. They were found to have the K_2SnCl_6 structure with a unit cell having an edge of length 9·73 Å., while the parameter u determining the position of the chlorine ions has a value of about 0·24. H. H.

Goßner (B.). *Über die Struktur von Quarz.* Centr. Min., Abt. A, 1927, pp. 329–338, 4 figs.

The lengths of the cell-edges of α-quartz have been re-determined by F. Mussgnung as $a = 4{\cdot}89$, $c = 5{\cdot}46$ Å. The author shows that rotation photographs of a crystal from a quartzite at Osnabrück confirm the conclusions of W. H. Bragg and R. E. Gibbs as to the space-group, namely, D_3^4 or D_3^6 [M.A. **3**–21]. He proceeds to discuss the possibility of a polymorphous transformation from one form to the other as due merely to changes in atom symmetry, without any displacement of the centre of gravity of the layers. F. A. B.

Pauling (Linus) & Sturdivant (J. H.). *The crystal structure of brookite.* Zeits. Krist., 1928, vol. 68, pp. 239–256, 6 figs.

By the aid of Laue and spectral photographs brookite was found to have a space-group V_h^{15} and a unit cell containing eight molecules of TiO_2 with edges of lengths $a = 9{\cdot}166$, $b = 5{\cdot}436$, $c = 5{\cdot}135$ Å. Each titanium atom is surrounded by six oxygen atoms and each

oxygen atom by three titanium atoms. The average distance between adjacent titanium and oxygen atoms is 1·95 Å. H. H.

Schröder (A.). *Röntgenographische Feinbauuntersuchung am Brookit und über physikalische Eigenschaften der 3 Titandioxyde.* Fortschr. Min. Krist. Petr., 1927, vol. 12, pp. 83–84 ; Centr. Min., Abt. A, 1927, pp. 379–381 ; Zeits. Krist., 1928, vol. 66, pp. 493–494.

Schröder (Alfred). *Beiträge zur Kenntnis des Feinbaues des Brookits und des physikalischen Verhaltens sowie der Zustandsänderungen der drei natürlichen Titandioxyde.* Zeits. Krist., 1928, vol. 67, pp. 485–542, 27 figs. Reprints as Dissertation, Hamburg, 1928.

Rotation-spectrum and Laue methods gave an orthorhombic unit cell for brookite having edges of $a = 9{\cdot}136$, $b = 5{\cdot}439$, $c = 5{\cdot}153$ Å., and containing eight molecules of TiO_2. Extensive tables are given showing the principal refractive indices of brookite, anatase, and rutile for various wave-lengths and temperatures, and giving the coefficients of thermal expansion of these three substances for various temperatures. H. H.

Bräkken (H.). *Die Kristallstruktur von Titanmonoxyd.* Zeits. Krist., 1928, vol. 67, pp. 547–549.

The Debye-Scherrer method gives for TiO a sodium-chloride structure with lattice constant 4·235 Å. H. H.

Tokody (László). *A chromit kristályszerkezete.—Über die Krystallstructur des Chromits.* Mat. Természettud. Értesítő, Budapest, 1928, vol. 45, pp. 278–286 (Hung.), pp. 287–289 (Germ. summary). [See M.A. **3**–527.]

Zachariasen (William). *Über die Kristallstruktur der wasserlöslichen Modification der Germaniumdioxyds.* Zeits. Krist., 1928, vol. 67, pp. 226–234.

Germanium dioxide has the α-quartz structure, the space-group being D_3^4 or D_3^6. The unit cell contains three molecules and has dimensions $a = 4{\cdot}972$, $c = 5{\cdot}648$ Å. H. H.

Böhm (J.). *Röntgenographische Untersuchung der mikrokristallinen Eisenhydroxydminerale.* Zeits. Krist., 1928, vol. 68, pp. 567–585, 2 figs.

Basing his analysis on Debye-Scherrer powder photographs, the author investigates the group of minerals which includes limonite,

goethite, xanthosiderite, &c. He considers that the iron oxides and hydroxides are various forms of one or other of the substances α-Fe_2O_3, γ-Fe_2O_3, α-$Fe_2O_3.H_2O$, and γ-$Fe_2O_3.H_2O$. H. H.

Fricke (R.). *Über das kristallinische Tonerdehydrat v. Bonsdorff's.* Zeits. Anorg. Chem., 1928, vol. 175, pp. 249–256.

The crystalline aluminium hydroxide $Al(OH)_3$ prepared by P. A. von Bonsdorff in 1833, and obtained by very slow precipitation from alkali aluminate solutions by hydrolysis or by the action of carbon dioxide, is identical with gibbsite (hydrargillite). When, however, the precipitation is rapid the product shows by X-ray methods a structure identical with that obtained by J. Böhm [M.A. **3**-430] for aluminium hydroxide precipitated from acid solutions. The latter is also present in large amount in the purified product obtained in the K. J. Bayer process of working up bauxite. This form of $Al(OH)_3$, called 'bayerite', is metastable with respect to gibbsite. L. J. S.

Zachariasen (William Houlder). *Untersuchungen über die Kristallstruktur von Sesquioxyden und Verbindungen ABO_3.* Skrifter Norske Vid.-Akad. Oslo, I. Mat.-Nat. Kl., 1928, no. 4, 165 pp., 1 pl., 22 text-figs.

X-ray determinations have been made of the structure of numerous compounds of the types of A_2O_3 and ABO_3, and the interrelations of the various types of structure shown by these compounds are discussed in detail. Details are given for the following: corundum type of structure including Al_2O_3, Ti_2O_3, V_2O_3, Cr_2O_3, Fe_2O_3, Ga_2O_3, Rh_2O_3; cubic structure of many rare-earth oxides, Sc_2O_3, Yt_2O_3, &c., including also Mn_2O_3, Tl_2O_3; bixbyite [M.A. **3**–527]; aragonite structure including $SrCO_3$, $BaCO_3$, $PbCO_3$; other types of structure are represented by $AgNO_3$, $RbNO_3$, $KClO_3$, $KBrO_3$, HIO_3, $NaIO_3$; perovskite structure including $CsIO_3$, $SrZrO_3$, $CdTiO_3$; KNO_3; $AgClO_3$ and $AgBrO_3$; $MgTiO_3$ and $LiNbO_3$. The relations of structure to the atomic radii and the polarization of the ions are discussed according to the views of V. M. Goldschmidt [M.A. **3**–181, **3**–326]. L. J. S.

Gruner (John W.). *The chemical formula of boracite.* Amer. Min., 1928, vol. 13, pp. 481–483.

X-ray measurements of boracite gave: for colourless crystals (sp. gr. 2·92–2·97), $a = b = 16{\cdot}97$, $c = 12{\cdot}00$ Å., and for greenish crystals (sp. gr. 2·97–3·10), $a = b = 17{\cdot}11$, $c = 12{\cdot}10$ Å. Taking the usually accepted formula $Mg_7Cl_2B_{16}O_{30}$ (W. Heintz, 1859), this

gives 7·0 to 7·3 such molecules in the unit orthorhombic cell, which, from considerations of symmetry, is improbable. A new analysis by G. Ward of colourless crystals of boracite from Eime, Hannover, gave $MgCl_2$ 12·35, MgO 26·39, B_2O_3 (61·26), FeO trace, agreeing with the formula $Mg_{25}Cl_8B_{56}O_{105}$, or more probably $Mg_6Cl_2B_{14}O_{26}$. For the latter formula eight (7·845) molecules are accommodated in the unit cell. If, however, boracite is holohedral orthorhombic rather than hemimorphic, the formula may be $Mg_3ClB_7O_{13}$. L. J. S.

Schiebold (E.). *Über den Feinbau der Feldspate.* Fortschr. Min. Krist. Petr., 1927, vol. 12, pp. 78–82; Centr. Min., Abt. A, 1927, pp. 453–458; Zeits. Krist., 1928, vol. 66, pp. 488–493.

Felspars from various localities were investigated by means of Lauegrams and rotation-photographs. The unit cell contains four molecules, and its edges and angles are tabulated. The relationship between molecular volume and chemical composition is not quite linear; a maximum occurs for labradorite. The X-ray photographs emphasize the pseudo-tetragonal structure in agreement with crystallographic observations. The author states that the felspars can be considered as built upon a pseudo-cubic structure of thirty-two oxygen atoms, this corresponding to one of the two modes of closest packing used by Bragg in his investigation of the silicates [M.A. **3**–342].

	a.	*b*.	*c*.	*α*.	*β*.	*γ*.
Adularia ...	8·61 Å.	13·07 Å.	7·26 Å.	90°	116° 3′	90°
Sanidine ...	8·42	12·92	7·14	90	115 35	90
Microcline ...	8·44	13·00	7·21	90 7′	115 50	89 55′
Hyalophane...	8·50	12·92	7·12	90	115 35	90
Albite ...	8·23	13·00	7·25	94 3	115 29	88 9
Oligoclase ...	8·16	12·90	7·13	93 4	116 22	90 4
Labradorite ...	8·23	12·91	7·16	93 31	116 3	89 54
Anorthite ...	8·185	12·895	7·09	93 13	115 55	91 12

F. A. B.

Warren (B.) & Bragg (W. Lawrence). *The structure of diopside, $CaMg(SiO_3)_2$.* Zeits. Krist., 1928, vol. 69, pp. 168–193, 9 figs.

The space-group and cell dimensions of diopside as found by Wyckoff and Merwin [M.A. **2**–505] are verified, and the positions of all the atoms in the unit cell are determined. The calcium and magnesium atoms lie on the rotation axes. Round each silicon atom are grouped four oxygen atoms. H. H.

Taylor (W. H.). *The structure of sillimanite and mullite.* Zeits. Krist., 1928, vol. 68, pp. 503–521, 3 figs.

Sillimanite (fibrolite) belongs to the space-group V_h^{16}. The unit cell contains four molecules of Al_2SiO_5 and has edges $a = 7{\cdot}43$, $b = 7{\cdot}58$, $c = 5{\cdot}74$ Å. It is suggested that the structure of mullite ($Al_6Si_2O_{13}$) might be obtained by replacing silicon atoms of sillimanite by aluminium atoms, with only slight alterations in the positions of the oxygen atoms. H. H.

Taylor (W. H.) & Jackson (W. W.). *The structure of cyanite, Al_2SiO_5.* Proc. Roy. Soc. London, Ser. A, 1928, vol. 119, pp. 132–146, 5 figs.

Kyanite has a triclinic unit cell containing four molecules of Al_2SiO_5 with edges of lengths 7·09, 7·72, 5·56 Å., inclined at angles 90° 5½′, 101° 2′, 105° 44½′ with each other. The oxygen atoms are arranged in a slightly distorted, close-packed cubic structure with the formation of tetrahedral SiO_4 groups and of octahedral oxygen groups having an aluminium atom at the centre. H. H.

Alston (N. A.) & West (J.). *The structure of topaz $[Al(F,OH)]_2SiO_4$.* Proc. Roy. Soc. London, Ser. A, 1928, vol. 121, pp. 358–367, 3 figs.; Zeits. Krist., 1928, vol. 69, pp. 149–167, 4 figs.

Topaz has a unit cell containing four molecules of $[Al(F,OH)]_2SiO_4$ with edges 4·64, 8·78, 8·38 Å. The space-group is V_h^{16}. The authors determine the positions of all the atoms in the cell, and verify the result by a Fourier analysis of the three axial planes. H. H.

Pauling (Linus). *The crystal structure of topaz.* Proc. Nat. Acad. Sci. U.S.A., 1928, vol. 14, pp. 306–606, 1 fig.

Using the co-ordination theory of ionic crystals, the fundamental polyhedra for topaz are assumed to be an octahedron of oxygen and fluorine anions surrounding each aluminium ion and a tetrahedron of oxygen ions about each silicon ion. The structure so deduced agrees with the data of J. Leonhardt [M.A. **2**–203]. L. J. S.

Mauguin (Ch.). *Étude des micas (non fluorés) au moyen des rayons X.* Compt. Rend. Acad. Sci. Paris, 1928, vol. 186, pp. 879–881.

The author concludes that the problem of the micas is to be solved by investigation of the crystal-structure (by the Laue-Bragg methods) rather than of the chemical constitution. Five micas examined are

shown to have a structure of superposed lamellae about 10×10^{-8} cm. in thickness. Each layer is derived from that below by an oblique translation, the crystalline unit being an oblique prism. Muscovite and margarite are exceptional, the translation being accompanied by a reflection in (010). In biotite the parameter b is only one-third of that for the other micas. The cells (except biotite) contain twelve atoms of oxygen, but it is not possible at present to account for the electropositive atoms. A. F. H.

Mauguin (Ch.) & Graber (L.). *Étude des micas fluorés au moyen des rayons X.* Compt. Rend. Acad. Sci. Paris, 1928, vol. 186, pp. 1131–1133.

Six fluorine-bearing micas are shown to have structures similar to the ordinary micas, the oxygen being partly replaced by fluorine, atom for atom, as in (F,OH). Similar replacements could be invented for other elements, but the difficulty is to prove that they really occur. A. F. H.

Mauguin (Ch.). *Étude des chlorites au moyen des rayons X.* Compt. Rend. Acad. Sci. Paris, 1928, vol. 186, pp. 1852–1855.

Pennine, leuchtenbergite, and grochauite are found to have a structure of lamellae parallel to the cleavage, approximately 14×10^{-8} cm. in thickness. Each layer is formed of lozenge-shaped cells with angles of 120° and the side $a = 3{\cdot}07 \times 10^{-8}$ cm., the same value as for biotite. But this cell is not large enough to contain a whole number of hydrogen atoms, and a cell three times the size is therefore proposed, as in the micas. A. F. H.

Mauguin (Ch.). *Les rayons X ne donnent pas toujours la véritable maille des cristaux.* Compt. Rend. Acad. Sci. Paris, 1928, vol. 187, pp. 303–304, 2 figs.

As shown by G. Friedel (ibid., 1928, vol. 186, p. 1788), X-rays do not always give the true crystal lattice. This is further illustrated by biotite and the chlorites (preceding abstracts). It is suggested that the lamellae (in biotite, &c.) are built up of irregularly distributed units derived by successive rotations of the normal mica cell, the result being to give only the statistical mean of the real cell dimensions. Faint markings on the photographs may confirm this theory, which is intended to explain the discrepancy between the apparent oxygen lattices for biotite and the other micas.

A. F. H.

Goßner (B.) & Kraus (O.). *Über die chemische Zusammensetzung von Apophyllit. Eine Anwendung röntgenographischer Methoden auf Probleme der Silikatchemie.* Zeits. Krist., 1928, vol. 68, pp. 595–615.

As the result of chemical analysis and X-ray photography, the chemical formula of apophyllite is taken as $4(Si_2O_5H_2.CaO_2H_2).KF$ with Na partly replacing K and OH replacing F isomorphously. The space-group is D_{4h}^{1}. The unit cell contains four molecules and has edges $a = 12{\cdot}73$ and $c = 15{\cdot}84$ Å. A discussion is given of the optical properties of the mineral and the nature of the combination of its H_2O. H. H.

Gruner (John W.). *Die Struktur des Analcims. I. Die Raumgruppe.* Zeits. Krist., 1928, vol. 68, pp. 363–378, 3 figs.

Analcime probably belongs to the space-group O_h^{10}. Its unit cell is cubic with an edge of 13·64 Å. and containing sixteen molecules of $NaAlSi_2O_8.H_2O$. The driving off of the water of crystallization causes very little alteration in the struction. [M.A. **3**–530.] H. H.

Möller (H.) & Reis (A.). *Zur Methodik der röntgenographischen Untersuchung trikliner Kristallarten.* Zeits. Krist., 1928, vol. 67, pp. 555–558.

A note on the data necessary for determining the smallest translation-cell in a triclinic crystal, with the correction of an error in an earlier paper [M.A. **3** 531], and applications to $KClO_4$, tartaric acid, malic acid, &c. H. H.

Wyckoff (Ralph W. G.). *On the crystal structure of tetraethyl ammonium iodide.* Zeits. Krist., 1928, vol. 67, pp. 550–554.

Tetraethyl ammonium iodide crystallizes in the class $4d$ (V_d). The unit cell is a tetragonal prism containing two molecules of $N(C_2H_5)_4I$, and having dimensions given by $a = 8{\cdot}87$, $c = 6{\cdot}95$ Å. H. H.

Hendricks(Sterling B.). *The crystal structure of the n-mono butyl, amyl, hexyl, and heptyl ammonium halides.* Zeits. Krist., 1928, vol. 68, pp. 189–203, 3 figs.

The substances were prepared by neutralizing the primary amine with the appropriate halogen acid and subsequent desiccation of the solution. They form soft, thin crystals of the tetragonal system, which were subjected to examination by Laue, spectral, and powder methods. The structures are similar to that of *n*-mono methyl

ammonium iodide [M.A. **3**–530]. The carbon atoms of the hydrocarbon groups have a collinear configuration. H. H.

Wyckoff (Ralph W. G.). *The crystal structure of monoethyl ammonium chlorostannate*, $(NH_3C_2H_5)_2SnCl_6$. Zeits. Krist., 1928, vol. 68, pp. 231–238, 3 figs.

Laue and spectral photographs gave for $(NH_3C_2H_5)_2SnCl_6$ and $(NH_3C_2H_5)_2PtCl_6$ the space-group $3Di$—3 and a unit cell containing one molecule. The dimensions of this cell are given by $a = 7{\cdot}24$, $c = 8{\cdot}41$ Å. for the chlorostannate, and $a = 7{\cdot}13$, $c = 8{\cdot}53$ Å. for the chloroplatinate. H. H.

Hengstenberg (J.). *Röntgenuntersuchungen über den Bau der C-Ketten in Kohlenwasserstoffen* (C_nH_{2n+2}). Zeits. Krist., 1928, vol. 67, pp. 583–594, 5 figs.

An approximately orthogonal unit cell was found for $C_{35}H_{72}$, the length of the CH_2 group in the *c*-direction being 1·27 Å. For a mixture of paraffins with a large number of atoms a structure was obtained belonging to the space-group V_h^{16}, the carbon atoms being at a distance 1·52 Å. apart. H. H.

Reis (A.) & Schneider (W.). *Über den Kristallbau der cis-Äthylenoxyddikarbonsäure*. Zeits. Krist., 1928, vol. 68, pp. 586–594, 2 figs.

Monoclinic crystals of cis-ethylene oxide dicarboxylic acid have axial ratios $a : b : c = 3{\cdot}118 : 1 : 0{\cdot}998$, with $\beta = 88° 50'$. The space-group is C_{2h}^5 and the unit cell contains eight molecules of $C_4H_4O_5$ with edges $a = 21{\cdot}50$, $b = 6{\cdot}90$, $c = 6{\cdot}89$ Å. H. H.

Reis (A.) & Schneider (W.). *Über den Kristallbau von Weinsäure, Isohydrobenzoin und Rubidiumtartrat*. Zeits. Krist., 1928, vol. 69, pp. 62–76, 4 figs.

The unit cells of tartaric acid and isohydrobenzoin contain two molecules of $C_4H_6O_6$ and $C_{14}H_{14}O_2$ respectively. The space-group of both substances is C_2^2. The dimensions of the unit cell for $C_4H_6O_4$ are 7·68, 6·03, 6·18 Å. with $\beta = 79° 43'$ and for $C_{14}H_{14}O_2$ are 12·40, 7·92, 5·81 Å. with $\beta = 87° 7'$. The space-group of rubidium tartrate is probably D_3^4; its unit cell contains six molecules of $C_4H_4O_6Rb_2$, and has edges $\sqrt{3}$ (7·17), 7·17, 13·19 Å. H. H.

Schneider (W.). *Über den Kristallbau der wasserfreien Mesoweinsäure und einiger Mesotartrate*. Zeits. Krist., 1928, vol. 69, pp. 49–61, 1 fig.

The unit cell of anhydrous mesotartaric acid is triclinic. It contains two molecules of $C_4H_6O_6$, has edges 9·24, 6·33, 5·45 Å. and angles

70·5°, 78·0°, 79·5°. The unit cell of anhydrous thallium mesotartrate is triclinic. Two of its edges are of lengths 13·26 and 7·63 Å., enclosing an angle 86° 37′. It contains four molecules of $Tl_2C_4H_4O_6$. The crystallographic data of triclinic potassium mesotartrate are $a:b:c = 1·019:1:1·600$, $\alpha = 95° 44'$, $\beta = 102° 52'$, $\gamma = 61° 46'$. The unit cell has two edges of lengths 7·02 and 11·02 Å. enclosing an angle 102° 52′. It contains two molecules of $K_2C_4H_4O_6 . 2H_2O$.

H. H.

Mark (H.) & Susich (G. v.). *Über röntgenographische Versuche an Pentaerythrit.* Zeits. Krist., 1928, vol. 69, pp. 105–117, 3 pls.

An attempt is made to reconcile the discordance between the various structures that have been obtained for pentaerythritol, a summary of earlier work being given. A tetragonal unit cell containing two molecules of $C_5H_{12}O_4$ with edges $a = 6·09$, $c = 8·79$ Å. is obtained, and as the space-group is assigned either C_4^5 or S_4^2. But the tendency of the crystals to form multiple growths makes a complete determination of the structure at present impossible. H. H.

Möller (H.) & Reis (A.). *Der Kristallbau des Pentaerythrit-Tetraacetates.* Zeits. Krist., 1928, vol. 68, pp. 385–386.

In a note in 'Nature' (1928, vol. 121, p. 616) I. E. Knaggs had obtained the space-group C_{4h}^4 for pentaerythritol-tetraacetate, thereby differing from the result obtained by A. Gerstäcker, H. Möller, and A. Reis [M.A. **3**–532]. Reflections from the basal planes of the crystals were taken, and Knaggs's conclusion was confirmed.

H. H.

Herrmann (K.) & Burak (M.). *Röntgenographische Untersuchung des ortho- und meta-Nitranilins.* Zeits. Krist., 1928, vol. 67, pp. 189–225, 1 fig.

Ortho-nitroaniline has the space-group V_h^{17} and a unit cell containing sixteen molecules $C_6H_6O_2N$ with dimensions given by $a = 10·09$, $b = 29·44$, $c = 8·52$ Å. Meta-nitroaniline has the space-group C_{2v}^5. Its unit cell contains four molecules and has dimensions given by $a = 19·23$, $b = 6·48$, $c = 5·06$ Å. H. H.

Reis (A.) & Schneider (W.). *Über den Kristallbau von Indigo und Fumarsäure.* Zeits. Krist., 1928, vol. 68, pp. 543–566, 4 figs.

Indigo forms monoclinic crystals with $a:b:c = 1·897:1:1·741$, $\beta = 72° 30'$. The space-group is C_{2h}^5. The unit cell contains two molecules of $C_{16}H_{10}O_2N_2$ and has edges $a = 11·00$, $b = 5·8$, $c = 10·09$ Å.

Fumaric acid forms monoclinic crystals with $a : b : c = 0{\cdot}503 : 1 : 0{\cdot}438$, $\beta = 68° 55'$. The space-group is C_{2h}^5. The unit cell contains six molecules of $C_4H_4O_4$ and has edges $a = 7{\cdot}60$, $b = 15{\cdot}11$, $c = 6{\cdot}61$ Å. These results for fumaric acid are contrasted with the triclinic structure given by K. Yardley in Journ. Chem. Soc. London, 1925, vol. 127, p. 2207. H. H.

Brill (Rudolf) & Meyer (Kurt H.). *Röntgenuntersuchungen an Laurinsäure.* Zeits. Krist., 1928, vol. 67, pp. 570–582, 9 figs.

The unit cell of monoclinic lauric acid contains four molecules of $C_{12}H_{24}O_2$ and has dimensions given by $a = 9{\cdot}76$, $b = 4{\cdot}98$, $c = 36{\cdot}9$ Å., with $\beta = 48° 36'$. The space-group is probably C_{2h}^1 or C_{2h}^2. H. H.

Rock-forming Minerals and Petrology.

Barth (Tom.). *Ein neuer Zwilling bei triklinem Feldspat, Aklin B.* Zeits. Krist., 1928, vol. 68, pp. 473–475, 3 figs.

Adularia from the Simplon tunnel is described, which is triclinic and twinned. The twin-axis is [010], and the plane of junction is (100). H. H.

Barth (Tom.). *Die Lage des »rhombischen Schnittes« bei sauren Plagioklasen.* Zeits. Krist., 1928, vol. 68, pp. 616–618, 1 fig.

It is a disputed point whether the position of the plane of junction in pericline twins is the same for all felspars of the same chemical composition. As a result of measurements on perthite and plagioclase from south Norway the author concludes that no quantitative relation exists between this position and the composition. H. H.

Drugman (Julien). *Sur deux macles rares des orthoses de Zarzalejo.* Bol. R. Soc. Española Hist. Nat., 1927, vol. 27, pp. 437–441, 4 figs.

—— *Sur un exemple d'orthose, maclé suivant l'aréte p/m ; de Zarzalejo, prov. de Madrid.* Bull. Soc. Franç. Min., 1928, vol. 51, p. 193, 1 pl.

Orthoclase crystals have been described twinned according to the well-known laws, from this Spanish locality, by L. Fernández Navarro [M.A. **1**–13]. The author gives evidence for two further types of twinning. One, the Carlsbad-Baveno, with three individuals; and a second type, having $[1\bar{1}0]$ as twin-axis. In the latter case the angle $(001) : (010)$ is not quite 90°, and the material may therefore be microcline rather than orthoclase. F. A. B.

Aurousseau (M.) & Merwin (H. E.). *Olivine : I. From the Hawaiian Islands ; II. Pure forsterite.* Amer. Min., 1928, vol. 13, pp. 559–564.

Analyses of olivine grains from the volcanic ashes of Kilauea gave : I, for dark yellow material from the 1789 eruption, and II, for yellow grains from the 1840 eruption.

	SiO_2.	TiO_2.	Al_2O_3.	Cr_2O_3.	Fe_2O_3.	FeO.	MnO.	(Ni,Co)O.	CuO.	MgO.
I.	40·43	0·07	0·27	0·14	2·23	8·75	0·10	0·10	trace	47·45
II.	39·54	0·09	0·66	0·13	1·03	10·87	0·13	0·38	nil	46·57

	CaO.	Na_2O.	K_2O.	H_2O+.	H_2O-.	Total.	Sp. gr.	α.	γ.
I.	0·25	0·12	0·04	0·16	0·01	100·12	3·35–3·36	1·660	1·709
II.	trace	0·46	0·15	0·18	0·04	100·23	3·36–3·38	1·659	1·707

The dispersion of artificial forsterite, sp. gr. 3·223, was determined ; for Na, α 1·6359, β 1·6507, γ 1·6688. A very pale olivine from Fayal has sp. gr. 3·452, α 1·6702, β 1·6897, γ 1·7086 (Na). These values and the dispersion are compared with those of E. Ernst [M.A. **3**–58]. L. J. S.

Brauns (R.). *Die chemische Zusammensetzung von Augit und Biotit je aus tephritischer Lava und aus Laacher Trachyt.* Neues Jahrb. Min., Abt. A, 1928, Beil.-Bd. 57, pp. 131–138.

Large crystals of augite and biotite in the dark trachyte of the Laacher See, Rhineland, are foreign to this rock and have probably been derived from a deep-seated tephritic magma. The following analyses by A. Brauns and E. Frerichs are of : I, augite (sp. gr. 3·35, $c : \gamma = 46\frac{1}{2}°$, 2E 86°) from leucite-nepheline-basanite. II, augite (sp. gr. 3·30 3·34) from the dark trachyte. III, biotite (2E nearly 0°) from nepheline-haüyne-basalt scoria. IV, biotite from the dark trachyte.

	SiO_2.	TiO_2.	Al_2O_3.	Fe_2O_3.	FeO.	MgO.	CaO.	Na_2O.	K_2O.	H_2O.	Total.
I.	47·59	2·78	7·71	1·50	3·36	12·45	23·24	1·02	0·21	—	99·86
II.	46·52	2·91	7·21	2·69	2·96	12·75	23·00	0·84	0·04	0·88	100·14[1]
III.	36·46	5·14	16·83	2·02	6·77	19·61	—	2·19	8·68	1·66	99·36
IV.	35·78	6·31	17·96	0·54	7·22	18·68	—	2·07	9·05	1·83	99·44

[1] Incl. MnO 0·34.

L. J. S.

Gotthard (Jaroslav). *O pyroxenech z vyvřelin okolí Lomnice nad Popelkou.* [On pyroxenes from eruptive rocks in the neighbourhood of Lomnice on the Popelkou.] Časopis Národního Musea, Praha, 1928, vol. 102, pp. 65–71, 2 figs.

The melaphyres in the Permian formation of NE. Bohemia contain the following varieties of pyroxene. (1) Typical hypersthene with

α 1·683, β 1·692, γ 1·696, 2V > 70°. (2) Clinohypersthene very similar to the normal hypersthene but with extinction-angles $c:\gamma$ up to 10°. (3) An optically uniaxial monoclinic pyroxene twinned on (100) and ($\bar{1}22$) with α 1·6958, β 1·6970, γ 1·7180 (Na); translucent with pale rose-violet colour and faint pleochroism passing to greenish in the direction γ. (4) Monoclinic pyroxene with optic axial plane (010) and 2E about 60°. A comparison with the descriptions of W. Wah. and of A. F. Hallimond (1914) suggests that (3) is a diopside-hypersthene and (4) a hypersthene-augite. F. S.

Billings (Marland). *The chemistry, optics, and genesis of the hastingsite group of amphiboles.* Amer. Min., 1928, vol. 13, pp. 287–296.

Published analyses of hastingsite are tabulated, and compared with optical data determined on material from the same localities. New analyses by W. H. Herdsman are given of: I, ferrohastingsite in porphyritic nordmarkite from Jackson, New Hampshire; II, magnesiohastingsite in metamorphic limestone from Iron Hill, Colorado. With decreasing iron there is a decrease in the specific gravity and refractive indices and an increase in the optic axial angle. Alkali-hastingsite containing more alkalis cannot be distinguished optically. Magnesiohastingsite occurs in essexites and diorites, femaghastingsite in åkerites, and ferrohastingsite in nepheline-syenites and alkali-granites.

	SiO_2.	TiO_2.	Al_2O_3.	Fe_2O_3.	FeO.	MnO.
I.	37·40	3·20	12·34	4·16	25·84	1·24
II.	43·30	1·55	10·69	3·94	7·00	0·35

	MgO.	CaO.	Na_2O.	K_2O.	H_2O.	Total.
I.	2·20	9·72	1·80	1·36	0·60	99·86
II.	16·02	9·73	4·58	0·66	1·80	99·62

	Sp. gr.	α.	β.	γ.	2V.	$c:\gamma$.
I.	3·375	1·698	1·719	1·722	47°	20°
II.	3·160	1·653	1·663	1·670	64	40

L. J. S.

Peacock (Martin A.) & Fuller (Richard E.). *Chlorophaeite, sideromelane and palagonite from the Columbia River plateau.* Amer. Min., 1928, vol. 13, pp. 360–383, 1 pl.

These 'mineraloids' are described from the Tertiary basaltic fields of Washington and Oregon, and their nomenclature is discussed in detail. Chlorophaeite is limited to pitch-like material which is a hydration product of olivine, augite, and glass in basalts and dolerites;

the change from green to brown on exposure cannot be regarded as a decisive test, for the material may have suffered previous oxidation. Sideromelane is a basaltic glass formed by the rapid cooling, often by water, of basaltic lava flows; tachylyte is limited to the chilled selvages, rich in magnetite, of basalt dikes. Palagonite is a hydration product of sideromelane; and it further differs from chlorophaeite, with which it is sometimes confused, in containing more alumina. Chlorophaeite as nodules and veinlets in a trachydolerite dike from Grande Ronde valley, Washington, gave SiO_2 38·67, TiO_2 0·24, Al_2O_3 1·54, Fe_2O_3 26·14, FeO 2·06, MnO 0·31, MgO 6·77, CaO 1·72, K_2O 0·10, H_2O+ 9·56, H_2O- 12·54 = 99·65, agreeing approximately with $(Fe,Al)_2O_3.2(Mg,Fe,Ca)O.4SiO_2 + 10H_2O$; sp. gr. 2·267, n 1·500–1·540. Analyses are also given of sideromelane (sp. gr. 2·74, n 1·583) and tachylyte. L. J. S.

[Levinson-Lessing (F. Y.)] Loewinson-Lessing (F.). *Some queries on rock classification and nomenclature.*—Левинсон-Лессинг (Ф. Ю.). О некоторых спорных вопросах классификации и номенклатуры горных пород. Докл. Акад. Наук СССР (Compt. Rend. Acad. Sci. URSS), 1928, pp. 139–142. [English.]

Rocks oversaturated with silicic acid but showing no visible quartz (only 'potential' quartz) are distinguished by the prefix 'oxy'; e. g. quartz-porphyry and oxyporphyry (or acid porphyry), andesite and oxyandesite (or dacite), &c. The limitations of the term keratophyre are discussed. 'Keratophyres proper and oxykeratophyres are leucocratic paleotypic protopneumatolytic igneous rocks of the acid magma.' L. J. S.

Sederholm (J. J.). *On orbicular granites—spotted and nodular granites etc. and on the rapakivi texture.* Bull. Comm. Géol. Finlande, 1928, no. 83, 105 pp., 16 pls., 19 text-figs.

The author describes many orbicular granites, paying particular attention to those found in Finland at Puutsaari, Esbo, Kangasala, and Virvik. Some of the rocks have been described elsewhere, but the author adds much that is new both in observations and in deductions therefrom. He finds that the spheroids are 'exotropic' structures originating round a centre, and that they contain a nucleus which existed before the formation of the outer shells. The spheroids must have formed by crystallization from a molten magma. In the simplest cases there is mainly an aggregation of plagioclase with a

preponderating radial arrangement. The larger spheroids show also a concentric structure due to rhythmic crystallization of 'femic' minerals, generally biotite. The rhythm seems to have been caused by fractional crystallization, while diffusion was hindered by high viscosity. In composition orbicular granites are found to show certain peculiarities and could be classed in one magma-type for which the name 'esboite' is suggested. They are commonly rich in plagioclase, and this is fairly rich in albite. Such a magma must have been very viscous. This 'esboitic' magma is thought to be of a hybrid character, but whatever its origin it has suffered refusion before the formation of orbicular structures started. The author discusses the bearing of his deductions on the origin of porphyritic texture in igneous rocks and on theories of differentiation, and concludes with a modification of his earlier explanation of rapakivi textures. The paper contains six analyses of orbicular granites by Lauri Lokka.

W. C. S.

Nováček (Radim). *Minerály pegmatitů a sousedních hornin z Budislavě ve východních Čechách.* [Minerals of the pegmatites and surrounding rocks from Budislav in eastern Bohemia.] Časopis Národního Musea, Praha, 1928, vol. 102, pp. 91–95.

The biotite-pegmatites of Budislav vary very considerably in the relative amounts of quartz, biotite, microcline, orthoclase, and plagioclase (mostly oligoclase), and also in their accessory minerals, so that it is not possible to classify them with any definite type. A characteristic feature is the relatively high amount of manganese, which is concentrated principally in the garnets. The spessartine contains MnO 33·90 % with FeO 7·54 %; biotite contains MnO 0·64 %; and secondary calcite has MnO 0·80 %. Appreciable amounts of manganese are also present in the garnets of some other Bohemian pegmatites. Other minerals present in the Budislav pegmatites [M.A. **3**–348] are: black tourmaline as crystals up to 10 cm. long, which besides the common forms show the pyramid $(33\bar{6}1)$; orthite, violet fluorite, bluish-green apatite, zircon, pale-greenish beryl, clinozoisite, prehnite, pennine, chabazite, pyrite, pyrrhotine, and chalcopyrite. At the contact of the pegmatites with gabbro-diorite extensive biotitization has taken place. The gabbro-diorite contains nickeliferous pyrrhotine, mispickel, sphene, grothine, and ilmenite. Magmatic resorption of sedimentary gneisses by a quartz-diorite has given rise to fibrolite and almandine.

F. S.

Machatschki (Felix). *Beitrag zur Kenntnis der mittelsteirischen Pegmatite und ihrer Mineralien.* Centr. Min., Abt. A, 1927, pp. 240–254, 2 figs.

Describes various occurrences of pegmatite in central Styria, with chemical analyses of the tourmaline, albite, and garnet. L. J. S.

Sekanina (Josef). *Nerosty moravských pegmatitů.* [The minerals of Moravian pegmatites.] Časopis Moravského Zemského Musea, Brno, 1928, vol. 26, pp. 113–212, German summary, pp. 213–224, 4 pls., 5 text-figs.

A review is given of the literature (122 publications) on the pegmatites and pegmatite minerals of Moravia, including the well-known localities Rožná, Bory, Maršová, &c. The forms present on the two ends of tourmaline crystals of various colours and from different localities are noted, and a detailed account of the surface characters is illustrated by drawings and plotted light-figures. Analysis by B. Konečný of black tourmaline from Cyrilov gave SiO_2 34·87, TiO_2 1·01, B_2O_3 8·74, Al_2O_3 33·23, Fe_2O_3 4·45, FeO 8·57, MgO 1·00, CaO nil, Na_2O 3·51, K_2O 0·57, Li_2O 0·19, F 0·56, H_2O 3·64 = 100·34. Pseudomorphs, believed to be after tourmaline, from Dolní Bory are of three types. (1) Hexagonal prisms consisting of a crystalline kaolin-like mineral and a yellow to red isotropic mineral; with sp. gr. 2·317 to 2·364 and n 1·56; analysis by A. Slabá gave SiO_2 36·24, Al_2O_3 33·21, Fe_2O_3 7·38, H_2O (+105°) 12·33, H_2O (−105°) 8·70, with FeO, CaO, MgO, and alkalis, and Li_2O and B_2O_3 were detected spectroscopically. (2) Conical forms consisting of muscovite with very little of the red isotropic material; sp. gr. > 3, n 1·619. (3) Hexagonal pyramidal or barrel- and spindle-shaped, with composition similar to those of the first type but containing also grains of cordierite (β 1·569, sp. gr. 2·768) and aggregates of antigorite. Cordierite from this and other localities (Jihlava, β 1·550, sp. gr. 2·645; Humpolec, β 1·5468, sp. gr. 2·63) show a linear increase in β with increase in specific gravity. Andalusite occurs at Dolní Bory as a rose-coloured non-pleochroic variety, α 1·631, β 1·638, γ 1·643, sp. gr. 3·143, analysis I by J. Vysloužil; and as a deeper red-coloured variety with distinct pleochroism, α 1·634, β 1·639, γ 1·643, sp. gr. 3·154, analysis II.

	SiO_2.	Al_2O_3.	Fe_2O_3.	FeO.	CaO.	Na_2O.	K_2O.	Total.
I.	36·97	61·15	0·37	0·44	trace	0·35	trace	99·28
II.	36·86	61·47	1·56	—	0·06	0·48	0·25	100·68

Other minerals described from these pegmatites include anatase, cassiterite, and apatite. F. S.

Fersmann (A. E.). *Die Schriftstruktur der Granitpegmatite und ihre Entstehung.* Zeits. Krist., 1928, vol. 69, pp. 77–104, 6 pls., 12 text-figs.

Translation with some additions of a paper published in Russian in 1915 on the graphic intergrowth of quartz and felspar [M.A. **2**–63]. L. J. S.

Landes (Kenneth K.). *Sequence of mineralization in the Keystone, South Dakota, pegmatites.* Amer. Min., 1928, vol. 13, pp. 519–530, 537–558, 4 figs.

The paragenesis of minerals in these pegmatites indicates that they were formed in three stages: (1) a magmatic stage, when black tourmaline, muscovite, beryl, triphylite, apatite, microcline, and quartz crystallized out; (2) an intermediate stage, when mineralizers, rejected during the crystallization, acted on the minerals already formed, producing large crystals of spodumene, amblygonite, and beryl; (3) a hydrothermal stage, when solutions acted on and veined earlier minerals with the production of albite, lepidolite, yellow and green muscovite, indicolite, quartz, cassiterite, löllingite, columbite, and tantalite. L. J. S.

Kranck (E. H.). *On turjaite and the ijolite stem of Turja, Kola.* Fennia (Bull. Soc. Géogr. Finlande), Helsingfors, 1928, vol. 51, no. 5, 104 pp., 4 pls., 13 text-figs.

The Turja peninsula on the south coast of Kola, Russian Lapland, shows outcrops of alkali-rocks in syenitic porphyritic granite. Turjaite (of W. Ramsay, 1921) is a rather coarse-grained rock consisting of melilite (35), nepheline (17), biotite (33), apatite (5 – 10 %), together with perovskite, titanomagnetite, melanite, cebollite, &c. Associated rocks of the ijolite stem include malignite, ijolite, melteigite, aegirine-syenite, and aegirine-nepheline-syenite; lamprophyritic dike rocks include monchiquite, augitite, melilite-monchiquite, alnöitic rocks, and melanite-ouachitite; and there are also dike rocks rich in calcite with cancrinite, some of these carbonatite dikes consisting almost wholly of granular calcite (D. S. Belyankin in 1924 applied the name 'turjaite' to these rocks). Chemical analyses are given of several of these rocks and of the constituent minerals (melilite, biotite, melanite, augite, pectolite, olivine, together with optical data). The relations and genesis of the rocks are discussed. L. J. S.

Shand (S. J.). *The geology of Pilansberg (Pilaan's Berg) in the western Transvaal: a study of alkaline rocks and ring-intrusions.* Trans. Geol. Soc. S. Africa, 1929, vol. 31 (for 1928), pp. 97–156, 1 map, 3 pls., 2 text-figs.

Pilansberg is situated on the junction of the norite and the red granite of the Bushveld complex where a strong zone of foyaite dikes crosses the axis of the Bushveld syncline. The author has re-mapped the district and gives a complete account of its geology and petrology. The alkali-rocks form a thick laccolithic cake under a blanket of tuffs which were formed by explosions preceding the uprising of the magma. The earliest of the intrusive rocks to consolidate were red foyaite (liebenerite-foyaite) and syenite. Subsidence of this solid core caused later magma to well up round its edges, consolidating first as white foyaite and later as green foyaite, lujaurite, and tinguaite, the whole complex having a well-marked ring structure. The tinguaite forms a ring-dike, traceable for nearly half-way round the central intrusion. The author quotes earlier analyses of some of the rocks by F. Pisani published by H. A. Brouwer, and adds three new ones of the rocks as well as analyses by himself of liebenerite and of green microcline (amazonstone). Support is found for H. L. Alling's suggestion that the green colour of microcline is due to ferric orthoclase ($KFeSi_3O_8$). New observations are recorded on the characters of molengraaffite, and on pectolite as a constituent of tinguaites and microfoyaites. Many of the rocks are rich in eudialyte. W. C. S.

Eckermann (Harry von). *Hamrongite, a new Swedish alkaline mica lamprophyre.* Fennia (Bull. Soc. Géogr. Finlande), 1928, vol. 50, no. 13, 21 pp., 10 figs.

A dike rock traversing brecciated granite-gneiss in the parish of Hamrånge near Gävle (Gefle), Sweden, is named hamrongite. It is a quartz-kersantite containing quartz and calcite both in the groundmass and in vesicles, with andesine, orthoclase, porphyritic biotite, cordierite pseudomorphs, &c. Chemical analyses are given of the rock from the centre and the margins of the dike. L. J. S.

Walker (T. L.) & Parsons (A. L.). *The contact phenomena of the nepheline syenites of Port Coldwell, Ontario.* Univ. Toronto Studies, Geol. Ser., 1927, no. 24, pp. 28–32, 1 pl.

A composite dike in a dark basic rock shows borders of light-coloured nepheline-syenite with a dark central portion. Descriptions

and chemical analyses are given of these rocks. It is suggested that the changes have been effected by the injection of magmatic juices.

L. J. S.

Schürmann (H. M. E.). *Die Alkaligesteine der östlichen arabischen Wüste Ägyptens.* Geol. Rundschau, 1926, vol. 17a (Festschrift Gustav Steinmann), pp. 544–554, 1 pl., 1 text-fig.

Schürmann (E.). *Über die chemische Zusammensetzung einger Alkaligesteine aus der östlichen arabischen Wüste Ägyptens.* Centr. Min., Abt. A, 1928, pp. 121–126.

A series of alkali-rocks occurs between Ras Zeit in the north and Ras Abu Somer in the south in the eastern Arabian Desert in Egypt. Chemical analyses are given of riebeckite-aegirine-granite, riebeckite-porphyry, theralite, and bostonite ; also of riebeckite from the granite and a barkevikitic hornblende from the theralite. Paisanite associated with the granite contains much astrophyllite. L. J. S.

Soellner (J.). *Zur Petrographie und Geologie des Kaiserstuhlgebirges im Breisgau.* (Vorläufige Mitteilung.) Neues Jahrb. Min., Abt. A, 1927, vol. 55, pp. 299–318, 2 pls.

——— *Über essexitisch-theralitisch-monzonitische Tiefengesteine aus dem Kaiserstuhl und ihre Bedeutung für den geologischen Aufbau desselben.* Mitt. Badischen Geol. Landesanstalt, 1928, vol. 10, Heft 1, 93 pp., 2 pls. (map), 4 text-figs.

The discovery of plutonic rocks of essexitic character in the Kaiserstuhl, Baden, was made by the author in 1913. The present paper gives the results of his further researches on the distribution of these rocks, the history of the Kaiserstuhl volcano, and a description of the plutonic rocks with five new analyses. The analyses are discussed by the method of P. Niggli, and the rocks are named in accordance with his system : essexite-gabbro, theralite-gabbro, sommaitic monzonite, and theralitic ijolite (melteigite). The classification of one of the suite as monzonite leads to some discussion and an alternative designation 'Kali-Essexitgabbro' is suggested. The dolerite of Schelingen, and the dolerite and anamesite of Sponeck, of which A. Knop published analyses in 1892, are shown to belong to the same suite of essexitic-theralitic plutonic rocks. In the petrographic part of the paper the author gives the optical characters of the titanaugite and describes its alteration to biotite ('biotitization') under conditions of thermal metamorphism. There is much more

of interest in this paper for which space is not available in an abstract. W. C. S.

Duparc (L.) & Molly (E.). *Les gisements platinifères du Birbir (Abyssinie)*. Schweiz. Min. Petr. Mitt., 1928, vol. 8, pp. 240–257, 5 figs.

Duparc (L.), Molly (E.), & Borloz (A.). *Sur la birbirite, une roche nouvelle*. Compt. Rend. Soc. Phys. Hist. Nat. Genève, 1927, vol. 44, pp. 137–140.

The Abyssinian plateau consists of ancient crystalline rocks penetrated by many acid intrusions and fewer basic intrusions, and in part covered by Tertiary volcanic rocks. A basic intrusion on the Birbir river (a tributary through the Baro and the Sobat of the White Nile) shows a central area of dunite surrounded by pyroxenites, with gabbros outside the latter (an arrangement met with in the platinum-bearing districts of the Urals). The dunite has been largely altered to a compact brown quartzite (SiO_2 88·20, Fe_2O_3 9·01, Cr_2O_3 0·86, &c.) for which the name birbirite is proposed; and a similar rock is described from the chromiferous serpentine massif of Stopanje in Serbia. Platinum is found in small amount in the laterite covering the dunite and birbirite; analysis gave Pt 79·48, Os-Ir 1·41, Ir 0·82, Rh 0·75, Pd 0·49, Au 0·49, Fe 16·50. L. J. S.

Duparc (L.). *Contribution à la connaissance de la pétrographie et des gîtes minéraux du Maroc*. Ann. Soc. Géol. Belgique, 1926, vol. 49, Bull., pp. B 114–B 139.

A preliminary account of occurrences of galena in the neighbourhood of Oudjda [Ujda]; pyrolusite at Oued Akresch, 15 km. SSW. of Rabat; limonite in conglomerate at Soukh el Arba, on the Casablanca–Marakesch road. Descriptions are given also of melaphyres in the Permian of Demnat with three new chemical analyses: scapolite-bearing limestone at Sidi bou Otmane; biotite-granites and aplite from the Oued Za; a series of porphyries and porphyrites from a conglomerate at Mestigmer, west of Oudjda; and two new dike-rocks from the same district. The new rocks are: aiounite, an augite-bearing mica-lamprophyre remarkably rich in apatite, occurring as a dike in quartzite near El Aioun, west of Oudjda; mestigmerite, a mesocratic rock in appearance resembling a diorite, but in composition an augite-nepheline-syenite in which the nepheline and felspar are greatly altered. Chemical analyses are given of these two rocks. W. C. S.

Lacroix (A.). *Les pegmatitoïdes des roches volcaniques à facies basaltique.* Compt. Rend. Acad. Sci. Paris, 1928, vol. 187, pp. 321–326.

Coarse-grained differentiates of basaltic rocks occurring as dikes, veins, or streaks like the so-called nepheline-dolerites, are named pegmatitoids. These are well known among basic nepheline-bearing lavas, and the author now records examples from true basalts. One is described in andesine-basalt in the province of Wei t'chang (north China) in which the pegmatitoid is a 'sodic monzonitic shonkinite' approaching a basanite in composition. Other examples of which analyses are given are from Bora-Bora (Society Islands) and from Beaulieu (Bouches-du-Rhône). The pegmatitoids show much less MgO than the parent rocks. Similar comparisons could be made between the ankaratrites and their pegmatitoids; many instances are given. The pegmatitoids represent a final differentiation product of the basaltic magmas. W. C. S.

Lacroix (A.). *Sur la genèse de la jadéite de Birmanie.* Compt. Rend. Acad. Sci. Paris, 1928, vol. 187, pp. 489–493.

The jadeite at Tawmaw, Upper Burma, occurs, as described by A. W. G. Bleeck (1908), in the centre of a dike in serpentine, passing outwards into a jadeite-albite rock (jadeitite) with some soda-amphibole, then into an amphibolite in which the amphibole is actinolite, and finally on the walls of the dike into a chloritic rock. The jadeite has been regarded as a dynamo-metamorphic product of a nepheline syenite. The suggestion is now made that this is a case of desilicification of a granitic magma intruded into peridotite, but one in which the process has not proceeded so far as in the corundum-bearing rocks of Transvaal [M.A. **2**–80]. L. J. S.

Jaskólski (Stanisław). *O kilku łupkach chlorytowych Tatr zachodnich. — Über einige Chloritschiefer aus der Westtatra.* Bull. Intern. Acad. Polonaise, Cl. Sci. math. nat., Ser. A, 1928, for 1927, pp. 703–717, 1 pl., 3 text-figs.

The chlorite-schists of the Tatra Mts. grade into and have been derived from amphibolites and amphibole-biotite-schists. Chemical analyses of these rocks show a similarity in composition to diorites, from which the amphibolites were no doubt derived. Two analyses are also given of the chlorite isolated from these rocks, and their composition is compared with that of celadonite. L. J. S.

Walker (T. L.) & Gerrie (William). *Influence of hot natural brines on dolomitization.* Univ. Toronto Studies, Geol. Ser., 1927, no. 24, pp. 33–36.

Powdered shells and corals were agitated with sea-water of various concentrations for many days. At the ordinary temperature (about 20° C.) there was no appreciable gain of magnesium in the powder or loss from the sea-water; but at 97° C. the change was marked.

L. J. S.

Tarr (William Arthur). *The origin of chert and flint.* Univ. Missouri Studies, 1926, vol. 1, no. 2, 46 pp., 8 pls., 3 text-figs.

A review is given of the literature, and new observations extending over several years are added. Chert and flint are distinguished by their colour, the term flint being limited to the dark grey and black varieties. A collection of twenty-one chemical analyses shows a range in silica of 63·67 to 99·47 %. Small amounts of $CaCO_3$, $MgCO_3$, Al_2O_3, Fe_2O_3, H_2O, and carbonaceous matter are present. The author believes that the material has been directly precipitated from sea-water as colloidal silica, and is not an accumulation of organic remains (sponge spicules, &c.). L. J. S.

Richey (J. E.). *The north Ayrshire sequence of Calciferous Sandstone volcanic rocks.* (With appendix by A. G. MacGregor.) Trans. Geol. Soc. Glasgow, 1928, vol. 18, pp. 247–258, 2 figs., 1 pl.

The Calciferous Sandstone volcanic eruptions of the region studied commenced near the close of the Cementstone Group and extended into the succeeding Oil-Shale Group. The total thickness of volcanic rocks is at least 1,000 feet near Kilbirnie. There are two main stratigraphical groups: a lower group characterized by macroporphyritic basalts of Markle type, associated with mugearites and olivine-poor microporphyritic basalts of Jedburgh type; and an upper group of olivine-rich microporphyritic basalts mainly of Dalmeny type separating two trachytic zones. The lower trachytic zone consists of trachyte, with rhyolite and trachyandesite developed locally; the upper zone is almost invariably trachyandesite, well developed at Bennan and in the Ballagioch Hills. The trachytic lavas are limited to a definite belt of country, this localization being governed by the distribution of the volcanic vents. Comparisons are made with other Carboniferous volcanic rocks of Scotland. An appendix gives a table showing the porphyritic constituents of Carboniferous basalts. W. C. S.